What's in this issue—

PHILIP BLISS *Blank-Stoller*

How is industry doing in the race against obsolescence? **Has the machinery bought in the last few years been for replacement or expansion?** Philip Bliss, president of the Warner & Swasey Co., tells on page 311 the results of a "sampling" survey made by his company which help to answer these questions.

For the production shop man interested in accuracy of manufacture—a series of pictures on pages 314-317 showing the **machining of refrigerator compressors.** See how Mills Novelty Co. has built long life into its compressors.

How would you **spray molten metal onto a steel surface,** with inert gas or compressed air? A. V. Gruber, Condenser Service & Engineering Co., tells you on page 318 what comparative tests have shown.

Caterpillar Tractor now assembles its larger diesel-engine tractors on a **powered assembly line** which does away with the hazards, congestion and inconveniences of the old system. If you will turn to pages 324-325 you will see in picture form what the new set-up accomplishes.

Australia has had **compulsory arbitration and the minimum wage** for several decades, though they are hardly known here. How have they worked? E. J. Mehren supplies the answer on page 321.

What the Army does when it must **equip a machine shop in a hurry** is related by Lieutenant-Colonel Philip B. Fleming on page 323. The job was in connection with the 'Quoddy Power Project.

If you should be faced with the problem of **whether to make a screw of single or multiple thread,** you will get a helpful suggestion on page 326. A diagram aids in explaining matters.

A ratchetless micrometer may sound odd to you, but Bell Telephone Laboratories have **improved the accuracy of their micrometers** by substituting a light helical spring for the ratchet commonly used. On page 331 you will find the details.

The C.I.O. and other **unions are preparing for a big drive.** Why they are doing this in the midst of a business slump and what their objective are is told on page 334e.

COMING

Martin airplane landing fork

In the next issue

Unit body assembly of automobiles, where the car body and frame are integral, is a comparatively recent development in the motor industry. It presents new problems to those responsible for assembly and calls for specially-designed conveyors. In a series of pictures you will see how Lincoln-Zephyr does the job skillfully and economically.

Two half forks, one for each wheel, are used in the retractable landing gear of Martin bombing planes. When a fully-loaded bomber is standing on the field, the dead weight supported by each fork is 5600 lb. Impact load on the fork is high and during normal landing amounts to about 30,700 lb. Obviously the forks must be strong, yet light. In a feature article, well illustrated, we shall tell you how the Glenn L. Martin Co. makes these forks of composite construction involving stampings and seamless steel bushings.

Other subjects to be treated in the next issue include railroad press fits, the machining of lathe beds to close tolerances and die casting production methods. The article on die casting describes a new medium-size Detroit plant which has fine facilities for manufacturing castings, for constructing the dies and for cleaning and inspecting the castings and plating them when required.

In later issues

Nitriding finds a place in aircraft engine manufacture because of the extreme surface hardness it gives to steel with a minimum of distortion. A prominent aircraft engine builder has been using nitriding for eight months on cylinder barrels, knuckle pins, clutch plates and certain gears. It has installed a new department for this work and has developed a control of the process particularly applicable to its exacting requirements. This will be fully described in an early issue.

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AMERICAN MACHINIST

ESTABLISHED 1877

F. H. COLVIN • K. H. CONDIT • BURNHAM FINNEY, Editors

Why Not Train Them?

WHAT TO DO with our millions of unemployed is a vexing problem. Harry Hopkins would put them all on the government payroll. The fact that most of them would have to be assigned jobs for which they are totally unfit seems to be the least of his worries. He wants to keep them fed and sheltered, as we all do, and is willing to let some other government branch dig up the funds to finance the program.

But there is a limit beyond which those of us who pay taxes cannot and will not go in supporting ineffective government relief. The least that we can demand is that relief money be not wasted. If it is not to be wasted and instead is to be put to good use, why not spend some of it to train some of these unfortunates to earn a living?

Why should they be trained? Because this is a day of skill in industry. As equipment becomes more complicated, the men who operate it must be skilled and reliable. Take the steel industry. Myron Taylor points out that in one decade it has been transformed from a rough industry into a precision industry. He emphasizes that steel making today is a highly mechanized industry requiring a large amount of skilled labor and comparatively little unskilled labor. And most of the unemployed are in the unskilled class.

The manager of a mass production factory remarked only a week ago that he was letting his younger employees go and holding onto those with some skill and a measure of reliability. His comments on the value of the younger men were acid. Few of them had ever held real jobs because they had grown up when jobs were few. Their only working experience had been on W.P.A. projects, and the habits there acquired left much to be desired.

THIS SITUATION may come as good news to older workers many of whom have suffered as they crossed the so-called forty-year deadline, but it foreshadows a difficult period for industry in the years to come when the older men are gone and the W.P.A. trained generation must take their places.

More W.P.A. projects now will not help matters materially. The major objective during the next year or so should be to train these younger men for the jobs which industry will need them to fill. The government is probably not able to give them craft training, but industry will be more than willing to supply this if Congress and the Administration will devise a workable arrangement. How we are to inculcate habits of industry and reliability is quite another question—one that will probably require the generous cooperation of management, labor leaders and the government.

Gaging Business

SALES in the metal-working industries are on the mend. Machine tool orders rose 41% in March, most of the gain coming from the foreign field. Agricultural implement and tractor companies are running at 70% partly to take care of a spring sales spurt. Westinghouse's report of an increase of four million dollars in bookings during March compared with February, and of continued good sales in April is an index to improvement in manufacture of electrical equipment. With a huge navy building program ahead, the shipbuilding industry already is operating at about 75%. Around 100 government ships are in process of construction plus a number of private boats including tankers.

Railroad equipment purchases, long deferred, are now starting and should expand sharply as R.F.C. loans are successfully negotiated. Southern Railroad's inquiry for 5,000 cars is considered a forerunner of what is to come. Airplane makers are zipping along close to full capacity. The steel industry, coasting at 32.4%, and the motor car people, at about half of last year's phenomenal rate, are the principal laggards. Business Week's index of business activity is at 59.4 as against 57.6 a month ago.

NEW ENGLAND—Signs of Congressional independence have made business more cheerful, but machinery activities are mostly confined to quoting on inquiries. Appropriations for arsenal and shipyards work are eagerly awaited. Electrical apparatus and appliance sales have turned up a bit. Important transmission line construction on Cape Cod expected.

CLEVELAND — Equipment orders are slightly larger than in March, a gain in domestic sales offsetting a decline in foreign business. "Reasonable optimism" is reported by several machinery builders who expect a gradual rise the next few months. Auto parts companies are still slow. Steel mills have a fair number of miscellaneous orders, but tonnage is light.

PITTSBURGH — Immediate outlook is for steel production to linger close to the present low level. Sales support from automobile industry and other important steel buyers is lacking. Later on public works projects and railroad car buying are expected to stimulate steel demand. Though machinery purchases are not large, April volume will exceed previous months this year.

DETROIT—Few equipment orders are being placed as car makers mark time. Tool and die shops are a little busier, but the supply trade is off. Sales of business machines are moving sidewise, with no signs yet of improvement. Refrigerator manufacturers report heavy field stocks, and retail demand is relatively poor. But a slight gain is noted in commercial unit sales.

CINCINNATI — Domestic machinery sales are at low ebb and foreign orders are off. Auto parts and household equipment makers at Dayton are runnng three days a week. Indianapolis reports fair machinery inquiries, but poor sales.

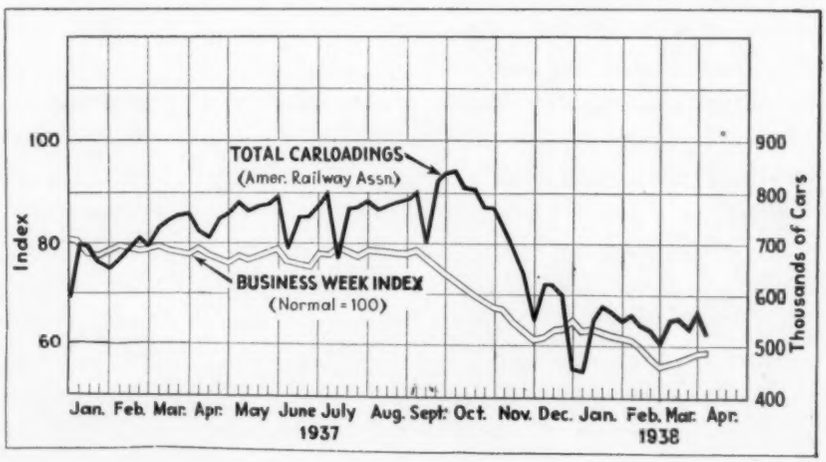
SAN FRANCISCO—Picking up early in April, machinery sales have been aided by the better business tone resulting from Washington developments. The recession has not seriously hit smaller industries on the Pacific Coast. The aviation industry is an especially bright spot, a major company reporting its first quarter 28% better than in the same quarter a year ago. Jurisdictional labor disputes in lumber, mining and sugar industries are holding back otherwise favorable factors.

CHICAGO—Production of farm implements and tractors continues at a high level, being sustained by Spring sales plus the building up of dealers' stocks. This industry and miscellaneous users are still the best buyers. The local steel industry, however, is pretty much in the doldrums. Railroads are buying some rails and estimates are that they will purchase as much rail tonnage this year as in 1937. Machinery sales have been meager, but an early increase is anticipated. Mail order houses report sales about 11% under last year. Kenosha has been hard hit, Nash and other plants operating at a low rate.

NEW YORK—Equipment sales have been few in number, but the amount of orders on executives' desks waiting to be approved is large. Business at Philadelphia is at low tide. Substantial buyers continue to adhere to a restricted purchasing policy.

CARLOADINGS VS. GENERAL BUSINESS

During recent months carloadings have closely paralleled the general state of business, but carloadings are again turning down.



A "Sampling" Survey Of Machine Tool Equipment

Questionnaire returns indicate we have so far succeeded in maintaining only a bare lead in the race against obsolescence

PHILIP E. BLISS
President, The Warner & Swasey Company

AMERICAN MACHINIST'S 1935 inventory of metal-working equipment showed that at the beginning of that year 65 per cent of the country's metal working equipment was over 10 years old, as compared to 48 per cent in 1930 and 44 per cent in 1925.

There were, of course, various reasons for the increase in proportion of old equipment, from 1925 to 1930—but chief among them was the decline in buying caused by the long extent of the depression. The 1930 figure was based upon statistics as of the end of 1929, and the 1935 figure upon statistics as of the end of 1934. This means that the jump from 48 per cent to 65 per cent indicated in the main simply the accumulated effect of five very lean years.

April the Peak

With the advent of 1935, however, machine tool buying began to pick up. By January of 1936 the Machine Tool Builders Association index of domestic orders stood at 95.7 (1926 average equals 100). From then on, the trend was, on the whole, steadily upward until the index touched a high point of 232.5 in April of 1937. A reverse trend was then apparent, with the index going downhill rapidly until it touched 53.5 in December of 1937. But in spite of this dip, the average for the two years was well over 100. The fact is that machine tools were bought in very fair volume through 1936 and 1937.

The question naturally arises—what effect has this buying had upon the obsolescence situation in the machine tool picture? Has the high degree of obsolescence revealed by the *American Machinist* 1935 survey been to a considerable extent corrected? If not, how much progress has been made in this direction? In short, where do we stand today?

By a peculiar coincidence, it so happened that a number of us were discussing this question in our office, last fall, when in came an article on this very subject in the *American Machinist* (Vol. 81, page 964). The article, written by John Haydock, managing editor of *American Machinist,* estimated that the percentage of old machine tools had been reduced slightly since 1935. Mr. Haydock calculated that as of July 1, 1937, 61 per cent of the country's metal working equipment was over ten years old, as compared to 65 per cent in 1935.

This conclusion provoked a rather sharp debate among several of us. The debate arose over the assumption upon which Mr. Haydock had predicated his calculations.

Basis for Estimate

In arriving at his figure, Mr. Haydock started with the number of machine tools estimated as less than ten years old in the 1935 *American Machinist* survey. To this number he added the number of new machine tools bought in the following 2½-year period, and then subtracted from this total the number of machines which had become more than ten years old during the 2½-year period. This gave him an estimate of machines less than ten years old in place as of July 1, 1937.

At this point, however, Mr. Haydock, in his article, raised the question as to whether machine tools recently installed represented replacements or additional equipment for expansion. He said, "A knowledge of the industry would lead to the assumption that by far the greater portion of these machines was installed as replacements. In some cases, one machine replaced two or more others, which tended to reduce the total number in use. This substitution of a more efficient machine for several older ones would tend to balance other units installed for purposes of expansion. Therefore, for the purposes of this estimate, it was assumed that the total number of machine tools in place was constant over the 2½-year period."

Replacement or Expansion?

It was this assumption which led to considerable argument. One of us raised the point that in the last two years various industries had been decentralizing and building new plants in new locations, equipping these plants with new machine tools. In the literal sense of the word, this could not be considered replacement. Furthermore, it was our recollection that in many cases companies which had bought new machine tools ostensibly for the purpose of replacing old machines had not actually scrapped the old machines after the new ones had been installed, but instead had continued to keep the old machines on the floor, using them for other work, or operating them as production rose above a certain level.

At the same time, we recognized, of course, that, as Mr. Haydock said, "the substitution of a more efficient

machine for several old ones would tend to balance other units installed for purposes of expansion."

The longer we thought about the matter, the more it became apparent to us that we did not have enough facts at our command to tell whether or not Mr. Haydock's assumption was correct, or to gage the accuracy of his estimate that the number of machine tools over ten years old had today dropped from 65 to 61 per cent.

Our curiosity was much aroused. So much so that it occurred to us that we might make an effort to find out more of the facts for ourselves.

The result, therefore, was that in January of this year we sent the following letter to executives of a thousand companies in the metal-working field:

DEAR SIR:

In the issue of October 20 of AMERICAN MACHINIST, *John Haydock, managing editor, estimates that today 61 per cent of machine tools are over ten years old (compared with the* AMERICAN MACHINIST *estimate of 65 per cent in 1935). Mr. Haydock states in his article that in arriving at this figure, he is assuming that by far the greater portion of the machines bought since 1935 represent replacements.*

Based on your own experience, would you say this assumption was correct? To what extent has new equipment actually replaced old machines? Have the old machines been scrapped and put out of production? Or has most of the new equipment been used for development and expansion purposes, leaving old equipment still on the floor and in operation?

In planning your equipment policy for 1938, we believe that it will be of interest to you to compare your experience with the average for industry as a whole. Naturally, the subject is also of interest to us as machine tool builders. We are therefore sending the attached questionnaire to you and to 1000 other representative manufacturers in a wide variety of business in all parts of the country. This "sampling method," used by Dr. Gallup in his weekly "Institute of Public Opinion," should provide an interesting and reasonably accurate picture.

Your co-operation will be much appreciated and we shall, of course, be glad to send you a summary and analysis of the answers received. None of the figures given by individual companies, nor even company names, will be used in compiling the results. The number of employees is asked simply to get some idea of the size of plant involved.

Yours very truly,

Of the firms queried, 251 returned questionnaires containing the desired information. These firms are representative of practically the entire field in which machine tools are used. Although we did not send questionnaires to extremely large companies, where the gathering of information might be too complicated, all major industrial divisions are covered in the replies. They cover, too, a number of comparatively small companies, because we wanted particularly to get the experience of the small and medium sized concerns which, after all, go to make up such a large share of our total manufacturing activities.

Briefly, in terms of number of employees, companies queried ranged from 12 to 8,500; in terms of number of machine tools in use, companies queried ranged from 4 to 5,800.

While we undertook merely to apply the "sampling method", nevertheless the sample obtained proved, after all, a comparatively large one. The firms replying to the questionnaire employ a total of 207,469 people and report 120,864 machine tools in use. On the basis of the last *American Machinist* estimate, this is nine per cent of all of the machine tools used in this country today.

The total of the various figures received gives the following results:

1. Of 120,864 machine tools employed by 251 representative firms in the manufacture of their products, 11,610 (9.6 per cent) were bought in the last two years.

2. Of these 11,610 new machines, 4,666 (40.2 per cent) represent actual replacement of old machines.

3. 7,377 old machines were actually scrapped by these 251 companies during the last two years.

4. 67.3 per cent of the machine tools today on the floors of these 251 firms are over ten years old.

From these figures a number of interesting conclusions are obvious:

1. In the last two years more machine tools have been bought for expansion than for replacement. Since, out of 11,610 new machine tools purchased, 4,666 are listed in replies as being for replacement, it is fair to assume that the balance (6,944) were for expansion.

A study of the questionnaire shows that some of these machines purchased for expansion are accounted for by new plants, new products, new ventures, and the like. But these by no means account for all of the machines presumably bought for expansion. There seems no question but that in many cases machine tools which no doubt should have been scrapped when new machines were bought were not scrapped, but instead were left on the floor and still kept in use or at least used for peak loads.

Thus one manufacturer writes, "There is always a tendency, when new tools are purchased to hold on for a while at least to the machines which the new equipment was bought to replace. The manufacturer always has the feeling that in a pinch the old equipment may come in handy. Thus in the average concern, I am inclined to think that while most new purchases are essentially for replacement and modernization, the actual discard of the old equipment does not take place simultaneously."

2. With so many old machine tools remaining on the floor, even though new machines have been purchased, the result has been an increase in the total number of machine tools in place. This shows up definitely in the questionnaire figures. While the 251 firms report 11,610 new machine tools bought within the last two years, they report only 7,377 scrapped, making a net increase of 4,233 in total number of machines. In other words, for every 100 new machines bought, 63.6 were scrapped.

3. This increase is one element explaining the rise in the per cent of machine tools over ten years old. To illustrate:

Roughly speaking, the questionnaire shows that out of every ten new machines purchased, four were for replacement — and six old machines were scrapped.

Let us apply these proportions to a company which, let us say, in 1935 had on its floor 100 machine tools, 65 of which were over 10 years old. Suppose that in 1936 and 1937 this company bought ten new machines, four of which were for replacement, and scrapped six old machines.

This gives it a total of 104 machines on the floor today.

But during 1936 and 1937 some of its machines which were less than ten years old in 1935 have now become over ten years old. The last big period of machine tool buying was between 1923 and 1929. Therefore, a great many machines must have passed the ten-year mark in the last two years. Let us assume that in this particular company there were ten machines which passed the ten-year mark some time during 1936 and 1937.

This means that today the company has 69 machines over ten years old (the 65 which were over ten years old in 1935 plus ten which passed the ten-year mark in the meantime, minus six which had been scrapped).

Dividing this figure by the total number of machines now on the floor—104—we find that the company today has 66.3 per cent of machine tools over ten years old, as compared to 65 per cent in 1935.

If this company had used all ten of its new machines for replacement, it would have scrapped (according to the ratio shown in the questionnaire returns) 15 old machines. It would then have had on its floor only 95 machines, out of which 60 would be ten years old —that is, 63 per cent.

The above simple figures show how, in spite of reasonably substantial purchases of new machines, the keeping of old machines on the floor, which adds to total number of machines in use, tends to increase the per cent of machine tools now over ten years old.

4. The really surprising fact brought out by the questionnaire is the small proportion of new purchases which has gone for replacement. The figures show that, on the whole, two new machines are doing the work of at least three that were scrapped—and in many cases one new machine is doing the work formerly done by two. And yet in spite of this fully recognized superiority of new machines over old, only about four per cent of machines on the floor today, according to questionnaire returns, represent replacement purchases within 1936 and 1937. This is at the rate of about two per cent a year.

Even granting that one new machine is equivalent to two old ones, at this rate it would still take 25 years to complete the job of replacement of obsolete equipment. But it is a simple matter of history that most machine tools become obsolete in a shorter period of time. The fact is that replacement of old machines definitely has not been keeping pace with obsolescence. If we have been holding our own, or advancing slightly, in total productivity, it is because the lag in replacement has been offset by the buying of machine tools for expansion purposes.

In studying the questionnaire returns with respect to this question of expansion versus replacement, we were intrigued by the surprising variation in replies. Some companies reported that practically all new machines bought were for expansion, while others reported that all machines bought were for replacement. The ratio differed widely among companies which bought both for replacement and expansion.

We attempted to classify the replies on this point into some sort of a pattern which might clarify the picture. Somewhat to our surprise, a definite pattern emerged when companies were classified according to size. Questionnaire replies naturally fell into the following three groups:

74 companies having less than 100 machine tools.

146 companies having between 100 and 899 machine tools.

31 companies having 900 or more machine tools.

In the latter group were several companies with over 3000 machine tools.

A complete analysis of questionnaire returns, including a classification on the above basis, is shown in the accompanying table.

Somewhat surprising conclusions followed from the breakdown of returns on the basis of size of companies, when we picked from the table of results the figures in the small table below.

Does this mean—as it certainly appears to mean—that smaller companies, in the last two years, have been able to forge ahead more rapidly than larger companies?

On the whole, we are inclined to believe that this conclusion is a correct one. The smaller companies not only bought more machines than the larger companies, in proportion to their size, but they scrapped fewer of their old machines. As shown in the tabulation of questionnaire returns, for every 100 new machines purchased in the last two years, small companies scrapped 27, medium sized companies scrapped 45, and large companies scrapped 86. In the case of the smaller companies, most of the old machines were evidently still needed on the floor even after the purchase of new ones. Apparently small company purchases, on the whole, really represented expanding business, as well as plant rehabilitation, to a greater extent than was the case with the larger companies.

If this is true, what is the explanation?

One answer appears repeatedly in comments written upon many of the questionnaires, telling why desired replacement programs have not yet been undertaken.

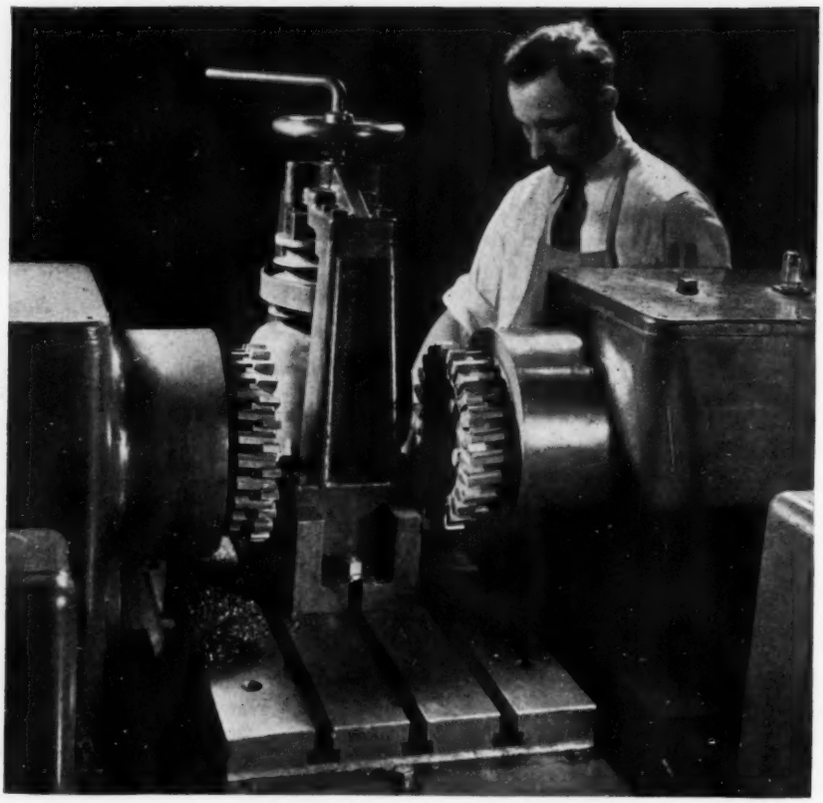
Typical of such comments is that of one manufacturer who remarked tersely that he would make large replacements this year "if it were not for the undistributed profits tax, the capital gains tax and the inability to finance." Or, as another manufacturer put it, "In short, the New Deal."

Size of Company	*% of Machines Now on Floor Purchased in Last Two Years*	*% of Machine Tools Purchased Which Actually Represent Replacement*	*% of Machines Now on Floor Over Ten Years Old*
* Small	14	29	58.1
Medium	12	39	62.2
Large	8	43	71.2

* Included among the companies here listed as "small" are a few larger companies which, however, had only small departments using machine tools. The number of such companies thus included is not sufficient, in our opinion, to alter the general conclusions to be drawn from this tabulation.

No. of companies reporting	No. of machines per company	% of total machines in our survey	% of total employment in our survey	% of total companies in our survey	A No. of machines purchased in last 2 years	B No. of machines purchased in last 2 years which are replacements	C (B/A) % of machines purchased in last 2 years which are replacements	100 Minus C % of machines purchased in last 2 years which represent expansion	D No. of old machines actually scrapped	(D/A) For every 100 machines purchased in last 2 years, how many old machines were scrapped?	E No. of machines over 10 years old	F Total No. of machines — new and old	(E/F) % of machines over 10 years old	G No. of men employed	(A/F) % of machines purchased in last 2 years
74	Less than 100	4	9	30	611	175	29%	71%	168	27	2489	4285	58.1%	19666	14%
146	100-899	38	51	58	5477	2135	39%	61%	2440	45	28861	46473	62.2%	104953	12%
31	900 and over	58	40	12	5522	2356	43%	57%	4769	86	49923	70106	71.2%	82850	8%
251	Total	100	100	100	11,610	4,666	40.2%	59.8%	7,377	63.6	81,273	120,864	67.3%	207,469	9.6%

Accuracy Lengthens



Stock is first removed from top and bottom face of cast alloy iron (38,000-40,000 lbs. per sq. in.) compressor block in this Defiance miller. Two dowel pin holes are then drilled in bottom face, and the part is returned to this machine for milling only the hard skin from the cross-bore faces as shown. Accuracy is required in the first operation, because the bottom face is used as a reference base for the remaining operations and must be square with the casting contour so that there will not be more metal on one edge of the cylinder then on the other. Extra thickness of 0.010 in. is left on top for the final face grinding operation. Cutter has stellite blades, cutting speed is 100 ft. per min., feed 10 in. per min.

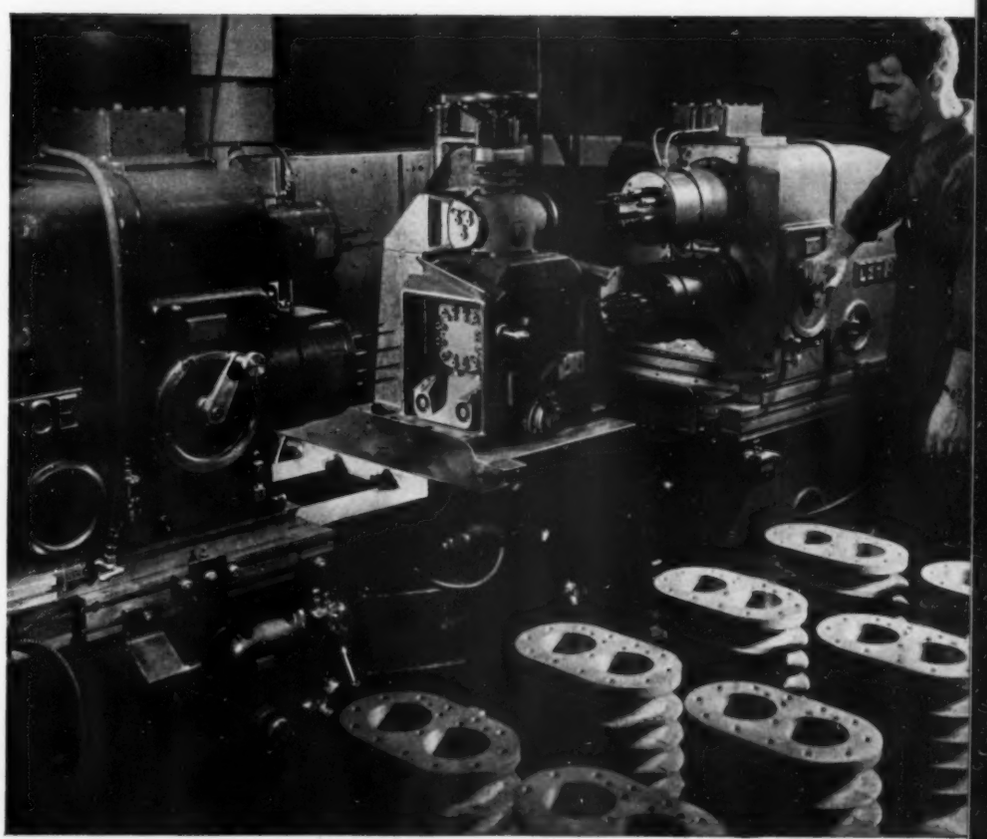
Next step is to rough core drill (right spindle) and semi-finish ream (left spindle) the cylinders. Tools feed at 350 ft. per min. and must run so true that the cylinder is not more than 60 sec. out of perpendicular with the journal bore. The reamer leaves 0.030 in. of stock to be removed by jig borers. Red lead on the bar keeps close fitting jig bushings from sticking. Replaceable brass wear strips on the reamer bar insure a constant true fit in the bushing

Defiance double-end boring machine rough (stellite) and finish (carbide) turns the inside and faces the cross bore. These faces, the seal housing and the thrust bearing face, must be 90 deg. with cylinder bore

Compressor Life

Looking up the line to where the castings begin: Fosdick & Neff, and Kohlbusch & Bissell diamond boring machines, just beyond the drills, finish the inside of the cylinders, leaving 0.0015 to 0.0020 in. of material to be removed by honing. A taper of 0.0002 in. in 5¼ in. is all that is permitted. Each man carries finished the piece from his machine to station ahead of the next machine while his machine operates automatically

RECORDS gathered by Mills Novelty Company, Chicago, over a period of years on its cooling devices showed that the main source of trouble was the refrigerator compressor. Since many of these devices are used in business places by people not mechanically inclined the refrigerator must have long life with little or no maintenance and must be quiet in operation. Accuracy of construction was determined to be the prime factor needed in fulfilling the qualifications. The machine shop for making the compressor was equipped with tools and gages to give the desired accuracy and laid out to give quantity production. Jigs and fixtures are provided so that the same machines will turn out four different size compressors. An indication of the strict requirements is that 156 dimensions must be checked by the final inspector on every compressor, and the majority of these have tolerances measured in ten-thousandths of an inch or seconds of an arc.



A special machine drills and taps valvehead and crankcase holes in the block in the lower part of a jig. The same fixture holds another block on top while the thrust-bearing and housing-seal holes are drilled and tapped. This machine is designed with the drilling feed hydraulic and tapping feed mechanical

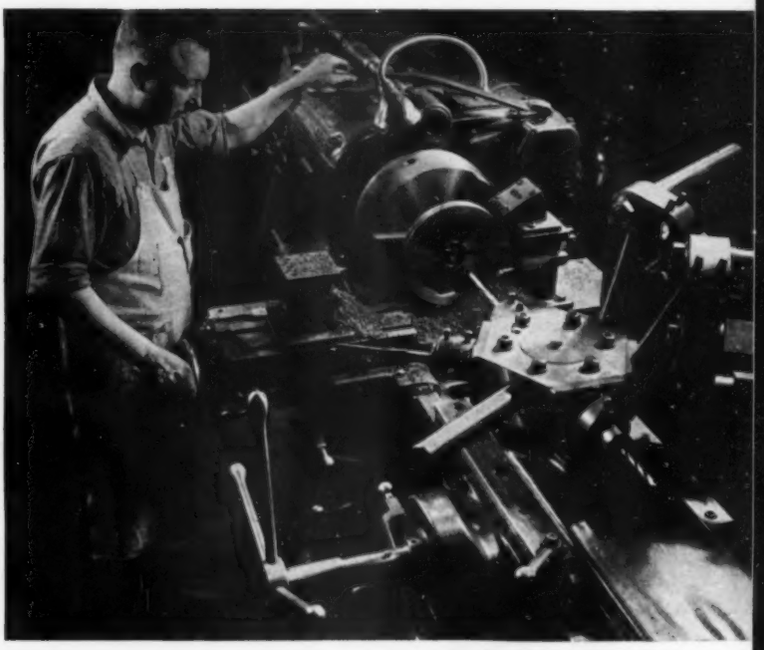
Photos by Korling

A Hutto honing machine finishes the inside of the cylinder to ± 0.0002 in. Oil plus soda is used as a lubricant which does not injure the workman's hands. Guards are built on front of the machine to prevent oil from splashing on his clothing. After this operation, the top face is finish ground in a Landis surface grinder. To keep the piston from striking the head, a tolerance of only 0.0002 in. is permitted in the dimension from the centerline of the cross-bore face to the top of the body. A Blanchard gage for measuring height is inclosed in brass and fastened to the machine by a brass arm to eliminate effects caused by the magnetic chuck. The top must have no marks, and a tolerance of 0.0002 in. out of flat in the 6½-in. width must not be exceeded, as a lead gasket is used

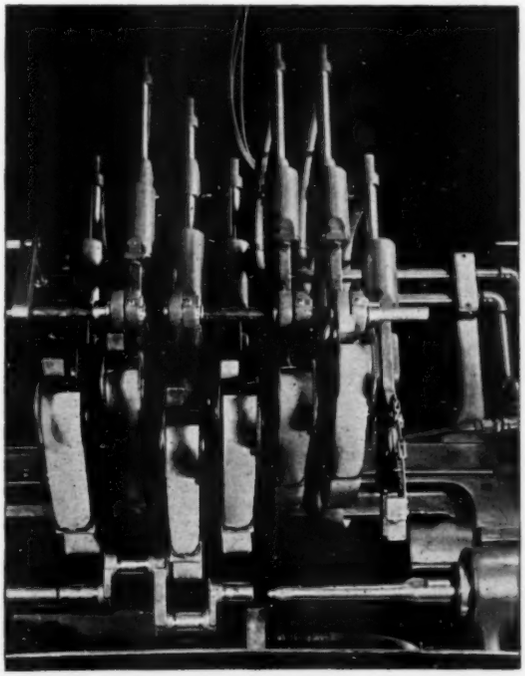
In addition to all the indicator and block gages in the shop, accuracy has been further achieved by establishing a "precision" room. A Taft-Peirce plate (4 ft. x 3 ft.), Johanssen blocks and 0.0001-in. indicators are used for checking sample castings, jigs, fixtures and gages. Production parts are checked only when something is radically wrong. All gages and indicators must be checked every time they are returned to the toolroom

Compressor cylinders are bored and reamed in a two-spindle Defiance vertical machine. The hydraulic feed has an automatic cycle: rapid advance, feed, quick return and stop. Jigs such as used in this set-up are made on two Swiss jig borers which serve the compressor shop

Forged crankshafts are rough ground in a Landis hydraulic crank pin grinder, moved to another for finish grinding. Approximately 3/32 in. of material is removed and 0.0003 in. left for final lapping operation. Crankpin surfaces must be less than 0.0003 in. out of parallel with shaft centerline. Arnold gages on the machine check operations. The operator checks each diameter after removal from the machine with a Zeiss visual scale micrometer



All machining on the flywheel is done in this Bardons & Oliver turret lathe, except for broaching of the keyway which is done in a LaPointe. (The broach also finishes the inside of the crankshaft hole and is claimed to give a better and more accurate finish than a reamer). When the upper bars on the turret are in position, they actuate the bar above the gear housing which moves the cutting tool through the chuck to face the rear of the flywheel hub. The groove in this wheel must not run out more than 0.008 in.



A Schraner lapping machine finishes the journal and crankpin bearing surfaces to give a highly polished finish

Completed compressors come down the assembly line ready for final tests from where they go to milk coolers, ice cream refrigerators, bottle coolers and so on. Stethoscopes check the quietness of operation

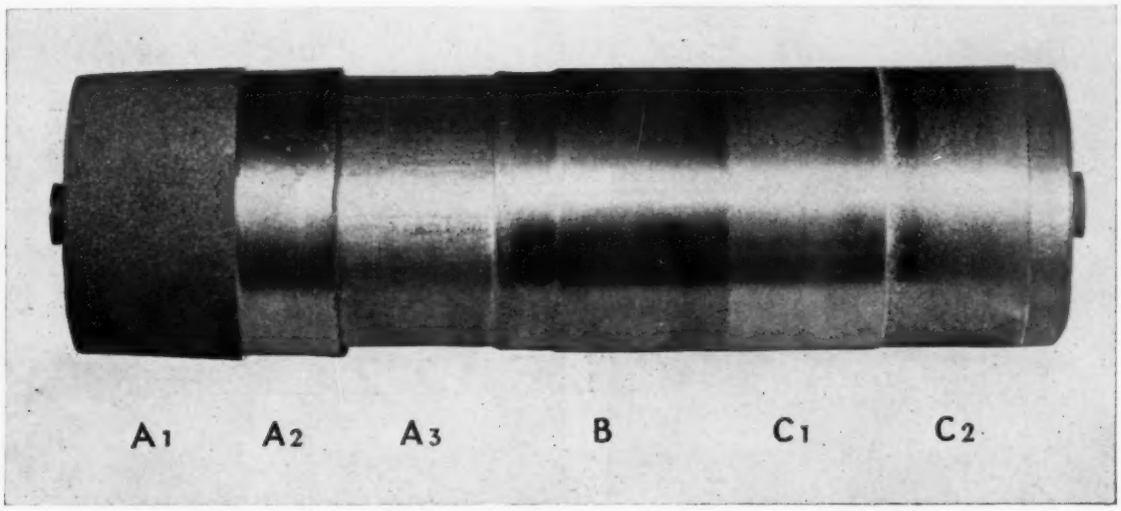


Fig. 1—Steel shaft sprayed using inert gas; Section A_1, surface of original sprayed stainless steel; A_2, stainless steel after cut has been taken; A_3, stainless steel turned down to parent metal of the shaft; *B*, sprayed bronze after cut has been taken; C_1, sprayed aluminum after cut has been taken; C_2, surface of aluminum sprayed with compressed air after cut has been taken

Inert Gas in Metal Spray

Comparative tests indicate greater resistance to corrosion for a variety of metals when applied by a spray gun employing inert gas

A. V. GRUBER
Superintendent Molten Metal Service Division
Condenser Service and Engineering Company

THE SUPERIORITY of inert gas over compressed air as the impelling agent for a molten metal has been definitely proved by tests made over a period of seven years. Until recently the cost of inert gas for metal spray has been prohibitive.

By altering the design of heads of metal spray guns and changing air passages we were able, efficiently and with good results, to reduce the consumption of inert gas for atomizing purposes to 15 cu. ft. per min.; that is, a 220 cu. ft. cylinder supplied the gas for fifteen minutes. But, with the cost of inert gas varying from $2.00 to $4.00 per cylinder of 220 cu. ft. capacity, the expense of running the spray gun ran exceedingly high. To all users inert gas as the impelling agent seemed too expensive.

The tests definitely show that the deposited metal is more compact, dense and contains few oxide inclusions. Rather than sacrifice the advantage a new source of inert gas was sought and found. Within the past half year we have developed an inert gas compressor which enables us to atomize molten metal at a cost as low as when using compressed air.

In machining sprayed metals applied by compressed air, the material usually crumbles off or comes off in short chips similar to machining cast iron. When metal sprayed with inert gas is machined, the metal can be turned off in long ribbons

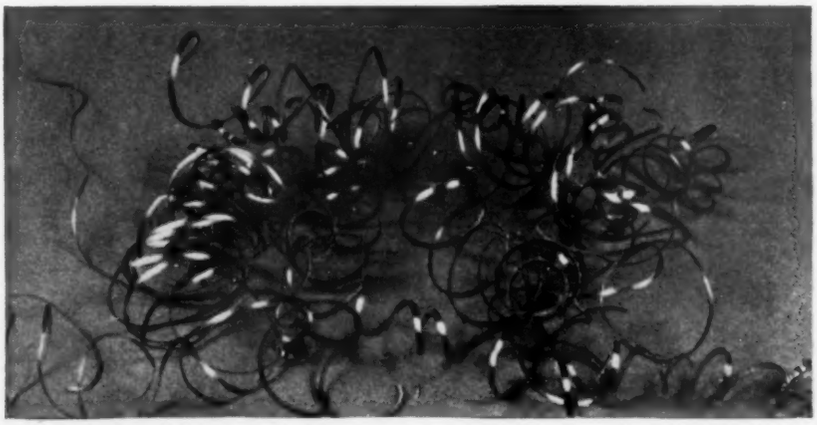
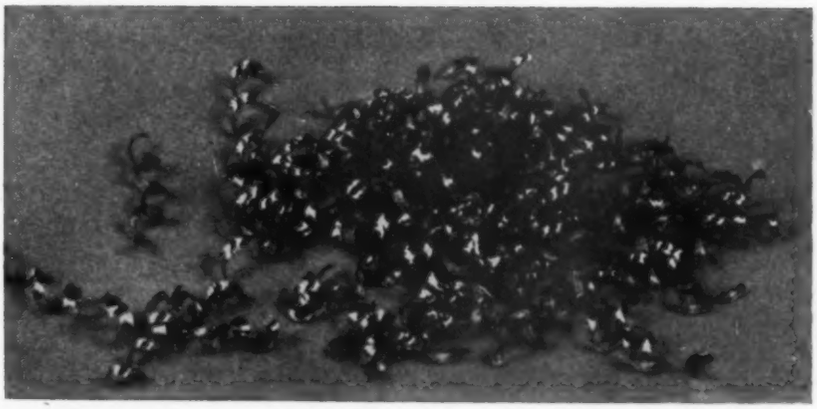


Fig. 2—Stainless steel turned from Section *A*, Fig. 1, gave these chips

Fig. 3—Bronze turnings from Section *B*, Fig. 1, are shown at right



similar to machining cold-rolled stock.

Fig. 1 shows a steel shaft sprayed with inert gas; Section *A*, stainless steel; Section *B*, bronze; and Section *C*, aluminum. The metal was sprayed on to a total thickness of $\frac{1}{8}$-in. on the radius. Figs. 2, 3 and 4 show turnings from Sections *A*, *B*, and *C* respectively.

Early in the year of 1935 a discussion with the maintenance engineer of a large eastern oil refinery about the resistance of steel protected by metal sprayed with inert gas to hydrogen sulphide corrosion at elevated temperatures, led to a series of tests to determine the possibilities.

The tests were conducted over a period of 217 days on steel plates sprayed with aluminum, chrome iron, 18-8 stainless steel with 0.3 per cent of titanium and 18-8 stainless steel. The metals were sprayed on foot square sections of $\frac{1}{4}$-in. thick, 0.30 carbon steel plate, to thicknesses as follows:

Fig. 5—Aluminum
0.020″ thick, sprayed with inert gas

Fig. 6—Chrome iron
0.033″ thick sprayed with inert gas

Fig. 7—18-8 Stainless steel with titanium
0.033″ thick, sprayed with inert gas

Fig. 8—18-8 Stainless steel
0.033″ hick, sprayed with inert gas

To determine the value of the metals sprayed with inert gas over compressed air, a similar set of materials was sprayed to the same thickness with compressed air. Figs. 5a, 6a, 7a and 8a show the same metals applied by this method.

An uncoated steel plate was also placed under the test conditions, as a guide to determine the corrosion effect on unprotected steel. All conditions were kept as nearly alike

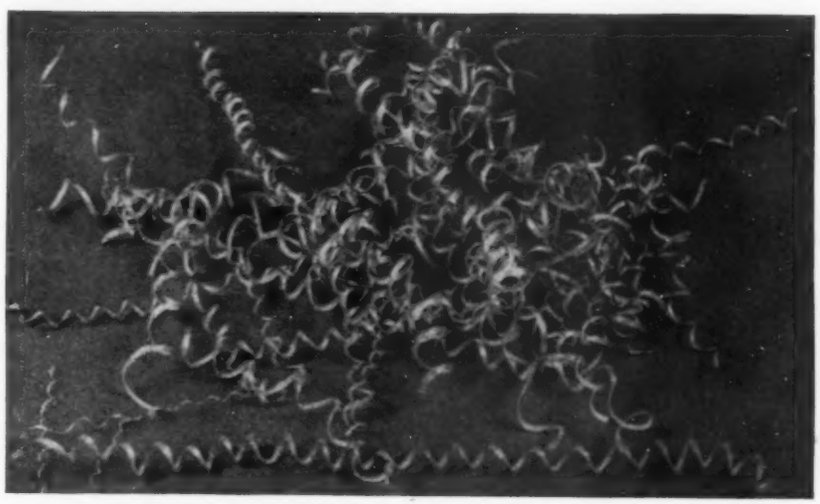
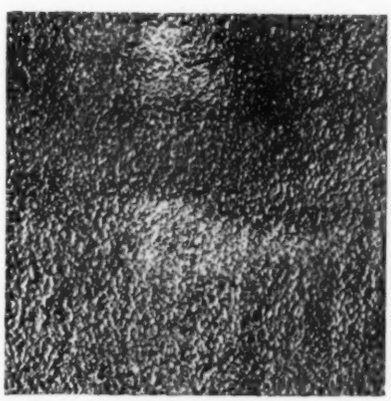
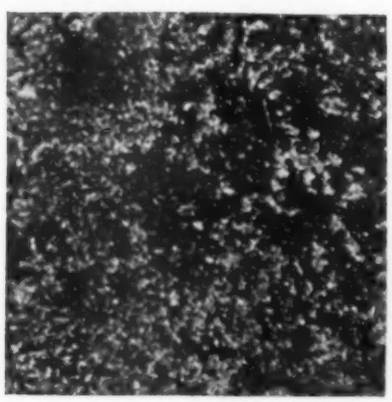
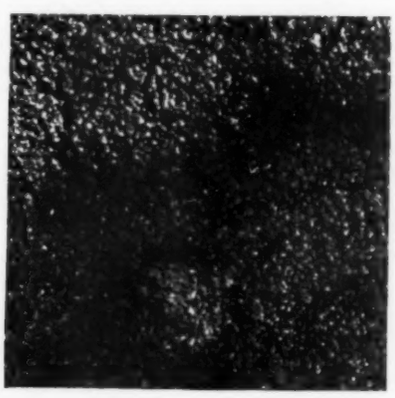


Fig. 4—These chips were produced by turning Section *C*, aluminum

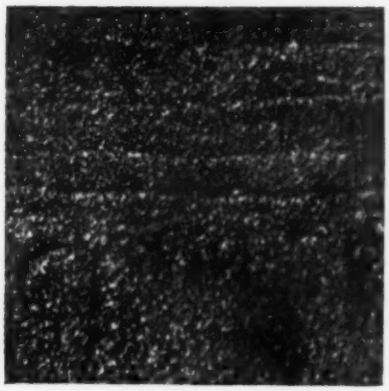


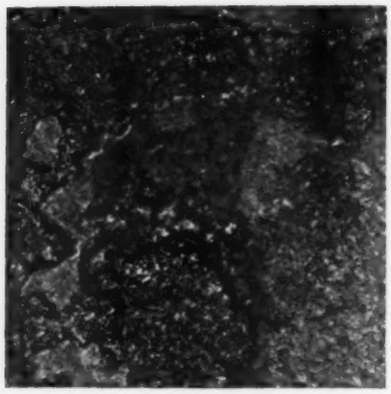




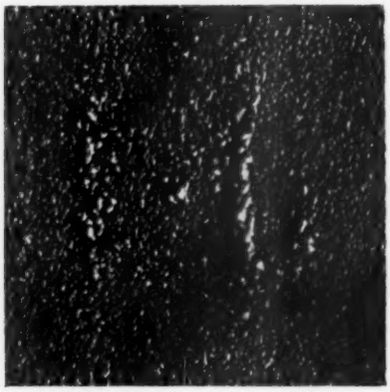
Figs. 5 and 5a—*(Above)* 217 days exposure to hydrogen sulphide at elevated temperatures: Horizontal passes show aluminum sprayed 1/32-in. thick with carbon dioxide; vertical passes, aluminum sprayed with nitrogen; 5a *(right)* aluminum sprayed with compressed air

Figs. 6 and 6a—*(Left)* 217 days exposure to hydrogen sulphide at elevated temperatures: Horizontal passes show chrome iron sprayed 1/32-in. thick with carbon dioxide; vertical passes, chrome iron sprayed with nitrogen; 6a *(right)* chrome iron sprayed with compressed air allowed corrosion to proceed





Figs. 7 and 7a—After 217 days exposure to hydrogen sulphide at elevated temperatures: Horizontal passes show 18-8 stainless steel with titanium sprayed 1/32 in. thick with carbon dioxide; vertical passes, 18-8 stainless steel with titanium sprayed with nitrogen; 7a *(right)* 18-8 stainless steel with titanium sprayed with compressed air



Figs. 8 and 8a—After 217 days exposure to hydrogen sulphide at elevated temperatures: Horizontal passes show 18-8 stainless steel sprayed 1/32 in. thick with carbon dioxide; vertical passes 18-8 stainless steel sprayed with nitrogen; 8a *(right)* 18-8 stainless steel sprayed with compressed air

as possible so that the only variable would be the inert gas.

In bonding the sprayed metals to the parent metal in the above tests we used the best known surface preparation. The surface was prepared by blasting with a special type of sharp abrasive grit which is found only in one locality in the United States.

As a test to determine whether the metal spray had been properly bonded, abrasive was blasted through a blast nozzle, held approximately 9 in. from the sprayed surface, in one spot, until the sprayed metal was worn away to the base metal, the air pressure being 100 lbs. and the rate of flow of brasive approximated 5 lbs. per min.

If the edges of the resulting crater, where they feather down to the base metal, remain well bonded, the surface had been properly prepared; if the edges of the crater tended to peel, curl and flake off, a proper bond was not secured. We have found but one abrasive that consistently gives us this secure bond.

All the spraying was done by one operator, using the same gun, with like air pressure and flame characteristics maintained throughout. The steel plates were hung in a bubble tower at a point where the corrosion due to hydrogen sulphide gave the company the greatest concern. They were all hung the same day and removed after 217 days exposure.

By comparing Figs. 5 and 5a one can readily see that the aluminum sprayed with compressed air has been greatly oxidized. Figures 6 and 6a show the high chrome iron sprayed with inert gas to be completely intact, whereas the same material sprayed with compressed air allowed the corrosion to proceed through the sprayed metal and attack the base.

Fig. 7 likewise shows that the stainless steel with titanium sprayed with inert gas was completely intact, whereas the same metal sprayed with compressed air (Fig. 7a) was porous, oxidized and its weakened surface was readily attacked by the hydrogen sulphide.

Fig. 8 shows the 18-8 stainless steel completely intact except in the lower left hand corner where the supply of inert gas had begun to run out, whereas the metal in Fig. 8a, sprayed with compressed air, became oxidized and porous to the extent that practically all the metal was removed by the hydrogen sulphide. A comparison of the stainless steel plates sprayed with compressed air indicates that the high chrome steel without nickel is more resistant to sulphur corrosion and that 18-8 stainless steel stabilized with titanium is more resistant than stainless steel without titanium.

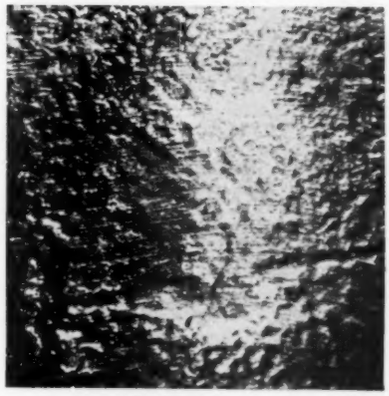


Fig. 9—An unprotected steel plate appeared as above after 217 days exposure to hydrogen sulphide at elevated temperatures

The unprotected steel plate, Fig. 9, was evenly reduced to half its original thickness of $\frac{1}{4}$ in. (except for the part covered by supporting band).

The tests show that all the materials sprayed with inert gas have excellent resistance value in the following order:

1. Aluminum
2. Chrome iron
3. 18-8 stainless steel with titanium
4. 18-8 stainless steel

Australia Arbitrates

Labor relations have been on a compulsory arbitration, legal minimum wage basis for a generation and no one wants to change the system except in details

EDWARD J. MEHREN
Past President, Portland Cement Association

AUSTRALIA has had compulsory arbitration and the minimum wage since the turn of the century. How do they work? That was the question put to dozens of Australians—employees, employers, and citizens generally—during an intensive inquiry lasting more than a month. The answer can be reduced to a simple statement:

Despite defects and criticisms, these systems work so well that employees, employers, and the public would not abandon them in favor of unregulated labor relations.

The employee tells you:

1. That arbitration and the minimum wage have given the lower-paid workers (the unskilled group) a decent standard of living and a higher wage than they would otherwise have obtained.
2. That they have done away with sweating.
3. That they have prevented the wage losses that would otherwise have occurred through more frequent strikes.

The employers say:

1. Strikes have been reduced in number and length—in many instances, almost eliminated. In some difficult occupations. such as coal mining, waterside work. and in the machinists and fitters trades connected therewith, the condition is different, but even here the relations between employer and labor have been materially improved by arbitration. For most industries there has been continuity of production, freedom from severe and recurrent strike losses, and an absence of the bitterness that strikes are likely to engender.
2. Price competition made possible by wage cuts has been eliminated.
3. Wages and hours have been stabilized, and the system enables each industry to present a solid front on these questions.
4. Arbitration successfully weathered the crisis of the depression.

The public applauds:

1. The better condition of the workers, particularly the unskilled.
2. The relative freedom from strikes.
3. A reasonably contented working class.

And when it is recalled that the public includes the farmers and pastoralists who sell in a world market, but have to bear the burden of higher industrial wages, their approval of arbitration and the basic wage carries particular significance.

No group is thoroughly satisfied, but the criticisms run to details and defects in administration. On the principle of arbitration all are united and on the affirmative side. They maintain that arbitration and the basic wage have been so beneficial that thought of their abandonment cannot be seriously entertained.

What is the System? The Commonwealth Act under which federal arbitration and the basic wage are administered, became law in 1904, four years after the formation of the Commonwealth. It has been amended several times and provides for:

1. Establishment of the Arbitration Court, whose decision is final on labor matters.
2. Registration of unions of employees and groups of employers with the Court.
3. Assessment of penalties for violation of the Court's decrees.
4. Compulsory negotiation of disputes, a procedure designed to obviate appeal to the Court, is possible.
5. Fixing of a minimum or "basic" wage.

The law gives the Court the power to enforce its awards, the penalties being de-registration or fines upon either unions or employers.

Mr. Mehren, former vice-president and editorial director of the McGraw-Hill Publishing Company, spent a month in Australia last fall studying labor conditions. It is interesting to compare this report on Australia with the one he wrote on New Zealand (*AM*—Vol. 82, page 70).

In Australia, as in New Zealand, the successive steps in labor negotiations are:

1. To attempt to settle the matter within the plant or the industry.
2. If agreement is impossible in private negotiations, to go to state or federal conciliation, as the jurisdiction may lie, or, in Victoria and Tasmania, to wage boards appointed in the several industries.
3. Should conciliation fail, to go to arbitration. In Victoria the wage board determinations are law, but may be carried to the Court of Industrial Appeals.

The greater number of questions are settled by private negotiation. Conciliation disposes of a goodly additional number. Still fewer go to the arbitration courts. In fact, it is the policy of the courts to encourage settlement by private negotiation or conciliation if possible. Court procedure is costly, involves delay, and has the element of contest rather than of common effort to disclose and assess the facts.

Agreements made privately or in conciliation committees may be registered with the Court and then have the force of Law.

Basic Wage. The "basic" or minimum wage is set by the Court and designed, in federal awards, to give a decent standard of living to a man, his wife, and two children. It is the minimum that may be paid to workers in industries covered by Court "awards" or by voluntary agreement filed with the Court. There are different rates for men and for women. The basic rate is increased or decreased quarterly in accordance with the rise or fall in the cost of living, with the proviso that changes are not made in basic wages until and unless the cost of living has changed by 2

shillings. Differentials in basic wages are allowed between areas, and between country and metropolitan districts in accordance with differences in living costs.

"Award" rates are those fixed by the court for different occupations and may not be less than basic wages. They include "margins for skill," which are differentials above the basic rate to compensate skilled and semi-skilled workers that rise or fall by the same amount as the changes in the basic rates.

"Prosperity Loading"

Recently another factor, in addition to the cost of living, has been considered—namely, the prosperity of the country, or the ability of the employer to pay and of the public to support a higher wage—for the Court declared a "prosperity loading" of 6s per week. This was added on petition of labor, but since wages had not until then returned to the pre-depression level, labor preferred to consider it a step in restoring its position rather than a share in the country's prosperity.

Should increases in wages endanger their position in competition with foreign goods, the manufacturers go to the Tariff Board and ask for further protection, which on occasion Parliament, on recommendation of the board, has granted.

In America it is argued that a minimum wage system would require a huge bureaucracy for its administration. Therefore Australia's experience is pertinent, especially since the mechanism here goes far beyond a single minimum wage and involves Court decision, registration, and enforcement of thousands upon thousands of rates, actually of a hundred or more in some industries. The unanimous testimony of employers is that the mechanism is not burdensome to them and has not built up the huge machine we anticipate. Two, three, or four months may be needed for a given industry to get its award upon the initiation of the system. But once the margins for skill are determined, the time and organization required thereafter are not burdensome. However, it is pertinent to remark that the population of Australia is much smaller than ours—about 7,000,000.

One interesting feature is that arbitration has developed here a new occupation—that of the "industrial advocate"—composed of men who devote all their time to the composition of differences on labor matters and to the presentation of cases before conciliation committees and the arbitration courts.

The unions have their industrial advocates (generally their secretaries, so have the employers. They come from the unions and the industries themselves and generally are not lawyers. In fact, some employers say, "If you want well-conducted, effective arbitration, keep the lawyers out. They snarl up questions with legal tape and make work for themselves. Further, they haven't enough experience in industry, to guide themselves or their principals wisely." However, the unions at times do employ barristers to help in presenting their cases.

The criticism most frequently expressed by labor, during this inquiry, was that award wages, which are minimums, tend to become maximums. This criticism appears in part to be justified for while some employers do pay higher than award rates, most of them contend that award rates are set after adequate presentation and careful consideration, and therefore represent the best judgment of what is fair. Thus their tendency is not to pay more than award rates, or if they do, to do it cautiously.

Slum Conditions Better

On the whole the effect of the system is to make the wage system fairly rigid. But this operates to the disadvantage only of the higher grades of workers. The lower groups definitely have a higher standard of living than formerly, and—so the testimony of all parties run—higher than they would have without the system. Welfare workers, whose business is with the poor and who have worked in America, assure me that the standard of living of these groups is higher than that of the lowest groups in the States, that there is not the abject poverty that we have at home and that their "slum" conditions are not nearly as bad as ours. Personal observation in their alleged "slum" quarters bore out the latter statement.

While there is some degree of rigidity, however, there is not absolute inflexibility. Superior workers get recognition by being paid higher than award rates, generally in the form of a bonus rather than of an increased rate. In some industries, though under protest now from the unions, they may, without change of work or the imposition of gang boss or foremanship responsibilities, be promoted to "staff," which means transfer to the salaried payroll, with an increase in pay, an annual vacation with pay, and a pension (on the employee-employer contributory basis.)

Further, some plants are on piece work, some pay bonus on production, some give a yearly wage dividend equal in per cent to the dividend paid the shareholders. The Commonwealth Court, by the way, is friendly to piecework, provided the rates are fair and allow the worker to earn at least 10 per cent more than previous hourly wages for the same work. The piece rates set in an award are, of course, "award rates" and cannot arbitrarily be changed by the employer.

It is evident, therefore—and this should be of much significance to American employers—that arbitration and the minimum wage have not eliminated the use of incentives. Such systems are more difficult to apply in some industries than with us, for some unions do not look kindly on them; but individual workers do, provided they believe the plans are fair.

Conciliation and arbitration have become the normal methods of adjusting labor relations that cannot be composed by private negotiation within the plant or industry itself. Both workers and employers turn to them naturally for the settlement of their differences. In the great majority of cases, in fact in nearly all, the mechanisms work smoothly and quite satisfactorily. The union leadres are trained negotiators and are responsible. They can, and do, see to it that they and their members carry out their agreements and accept the awards. If some strikes occur, it shows that there still are defects. The exceptions are regrettable, but on the whole the system works.

American labor leaders fear that arbitration would take away from them their strongest weapon, the strike. It is clear that this has not happened in Australia. Strikes in advance of Court hearings are not illegal, and in the case where they are (refusal to accept an award), enforcement—that is, compelled employment—has not, and, for obvious reasons will not, be attempted.

In sum, Australia's arbitration, cannot very well be termed compulsory, though that word is commonly used. Such compulsion as exists runs against the employer as might be expected.

This is a considerably condensed version of Mr. Mehren's report on Australian labor conditions. For the full report see *Factory Management and Maintenance*, March and April, 1938.

TALKING SHOP

Goggles—or a Tin Cup

Firing a man for not wearing goggles on a hazardous job seems a bit drastic to some. But it may be a kindness in saving his eyesight for himself and his family on another job. Of course, it's his own eye—as the extreme individualist insists—but losing it may make him a charge on the rest of us, as well as make it necessary to help support his family. So the rest of us have a stake in that eye as well as the man himself.

Chips and dirt in the eye were common accidents before we had goggles. Every shop had its "eye-doctor" who used a paper quill, a horsehair loop, or even his knife

blade to get the pieces out. But with goggles provided for jobs that may imperil the eye, accidents to the eye ought to be few and far between. Some men have the silly notion that it's unmanly to wear goggles, but it's a lot less humiliating than being led around with a tin cup. Gas masks aren't either comfortable or good looking, but all wear them in a bombarded area. Flying chips are constantly bombarding men in some jobs, and goggles are the only protection we know as yet.

What Is the Tolerance?

In spite of all that has been written about limit, tolerance and allowance, there is still more or less misunderstanding regarding them. Perhaps "tolerance" is used incorrectly more often than the others. You are often told that the tolerance is two-thousandths when it is really twice this, your informant meaning two-thousandths *plus or minus*. The confusion is avoided if the tolerance is unilateral. But you never know which is meant unless you see it on the drawing or ask about it. Total tolerance should be given in all cases. Unless this is done we need an additional term to tell the variation each side of basic size. Confusion costs money in delays and rejected parts.

Finger Tools

The other day we had the privilege of witnessing a demonstration of the finger tools developed by Mrs. Lillian Greneker of New York City. Mrs. Greneker's finger tools consist of water color paint brushes, medicine droppers, small screw drivers, manicure tools and beauty parlor equipment mounted on wood, metal or plastic thimbles that can be put on the fingers of thumbs of either hand. The ingenious feature of these thimbles is that each one has a small button at the lower end against which the end of the finger rests so that the fingernail does not constitute the bearing point for the thimble. This arrangement insures that the thimble with the tool it carries is directly in the axis of the finger to which it is attached instead of being slightly off center, as it would be if the end of a finger nail were the contact point.

So far the only commercial development of this idea has been in sets of thimbles carrying water color paint brushes for use by small school children. The psychological effect of this method of providing a paint brush for a child is most interesting, but not particularly important from our point of view.

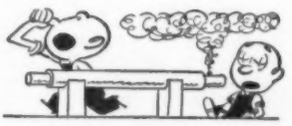
As we watched the demonstration of these finger tools it was clear that their use eliminated many motions and considerable time spent in picking up and putting down various tools in a set required for any particular operation. It occurred to us that tools of this sort could be readily developed for all sorts of small assembling operations where a screw driver, a pair of pliers, or a socket wrench of small size could be used. There might also be an adaptation of small files or burrs for finishing up small dies.

When we got that far at our imagining it was but a step to the idea that small power driven tools could be developed for application to thimbles. Such power tools might be driven by a motor of the type used in the modern electric shaver and could easily be strapped to the back of the hand of the worker. Perhaps this is a wild idea, but on the other hand, maybe the recounting of it may start some inventive genius at work

Magnaflux or Stink-pot

In discussing the use of the magnaflux method of detecting cracks in steel parts with an old railroad man he asked if we remembered the old "stink pot" method of 25 years ago. We didn't—and we're quite sure it must have had a limited application. But he claimed that it was effective—as well as being disagreeable.

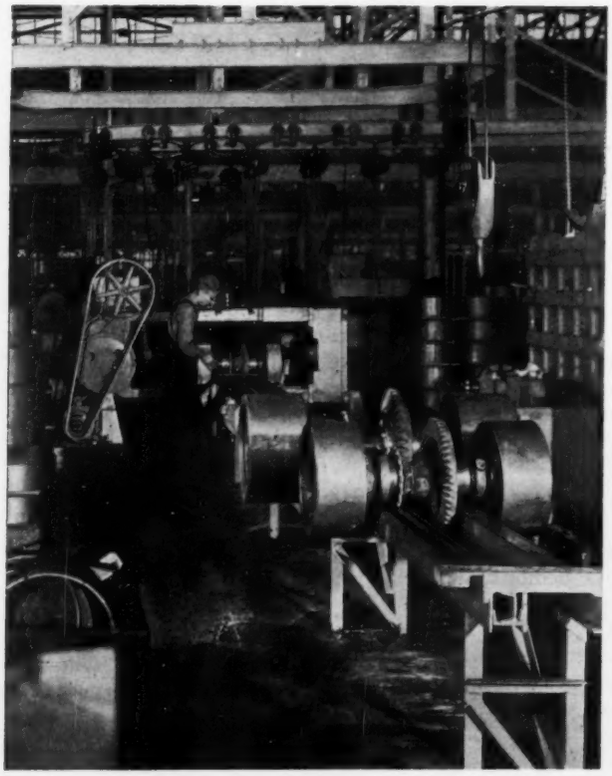
The plan was to drill a hole in a crank pin or an axle for the length of the bearing. Then the hole was filled with some ungodly compound that would make angels weep, and the hole plugged at the outer end. The stuff used—he didn't know or remember what it was except that it was sometimes red and sometimes



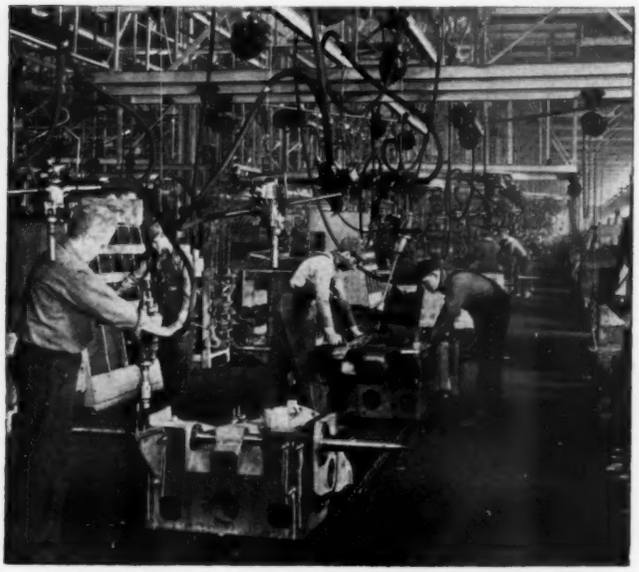
yellow—was so penetrating that it would find its way through any crack and make its presence felt, or smelt, in a manner that was as unmistakable as it was disagreeable. It also kept its potency so that if a crack developed at any later time the enginemen knew they had either killed a skunk or had a cracked pin somewhere. We'll take magnaflux, thank you! *The Editors.*

Tractor Builders

Tractor and farm implement makers in the Chicago area are reported to be operating at about 75 per cent of capacity which is pleasant news to industrialists' ears these days. Take a look at the new powered assembly line for its larger diesel tractors recently installed by the Caterpillar Tractor Company. It eliminates the hazards, congestion and inconveniences of the old system of assembly on manually moved dollies.

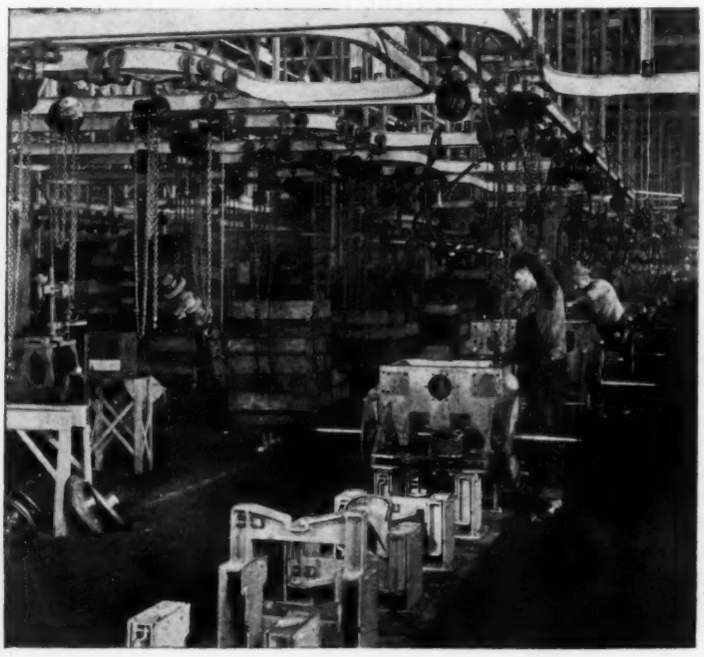


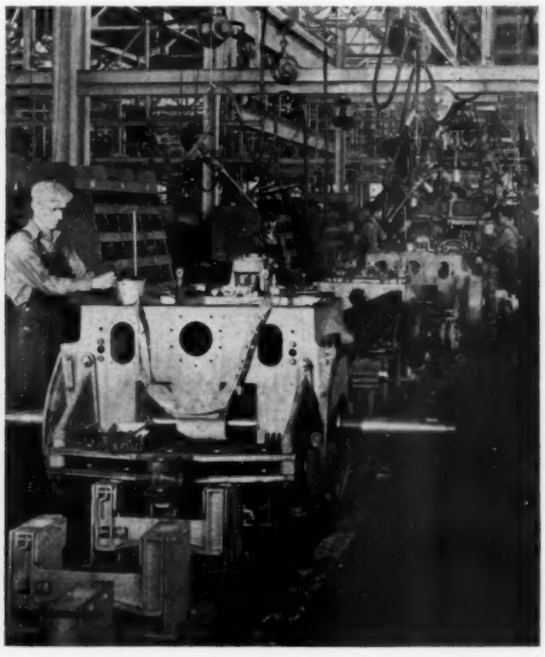
Steering clutch groups, assembled on the line illustrated, are rolled by hand to the assembly press which has been laid horizontal to save handling. After the pressing operation, the steering clutch assembly is rolled to the end of the line where a pneumatic hoist carries it to the main assembly



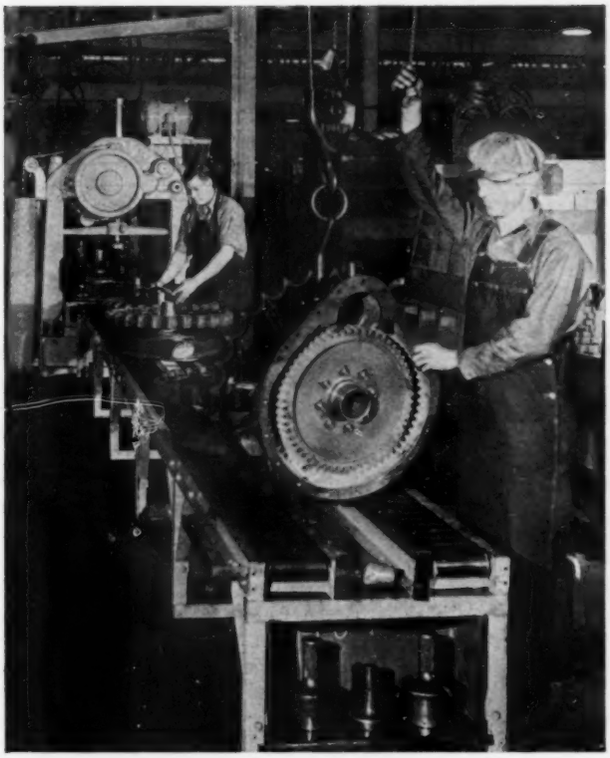
A short roller conveyor precedes the power conveyor used on the main assembly. After the shafts have been pressed in, the transmission case moves along to the station in the foreground where the drawbar plate studs are driven with a pneumatic stud driver suspended from an overhead monorail

The final drive pinion is carried on a monorail from the line at the left to be lowered into position in the transformer case. Adapters of the power conveyor are equally spaced at such intervals that any one of three sizes of tractor can be supported without special arrangement. Note that each adapter has a frame which swings upward to support the front end of the crankcase





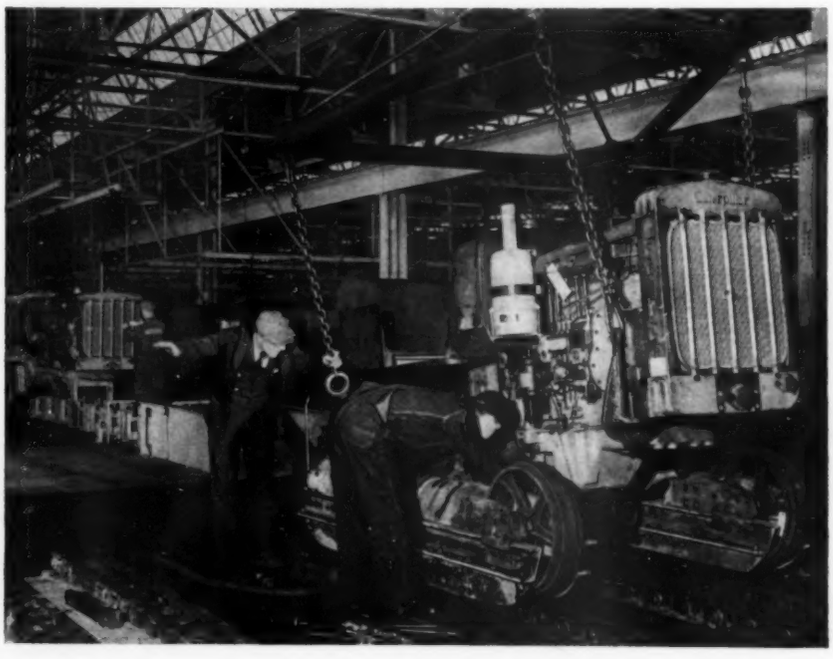
Are Kept Busy



Final drive and sprocket assemblies are put together with the use of a 50-ton power press. In the foreground is a completed sub-assembly ready to go into the tractor. The box under the conveyor holds three inspection gages handy for immediate use

Feeder lines which run directly into the main assembly lines are used for practically all sub-assemblies resulting in the least possible handling and lifting by operators. That illustrated shows the building of final drive pinion assemblies

Left. Gaskets are shellacked in place on the transmission case joint preparatory to mounting the final drive and sprocket assembly. The powered final assembly line is 400 ft. long with all tools in accessible overhead positions, pneumatically operated. Generous use of overhead monorail and hoists eliminate fatiguing labor



Right. An overhead hoist carries the tractor to its proper truck already set on stationary links fastened to the floor at the end of the main assembly line. After assembly the tractor is driven under its own power off these links to its own track which has been laid on the floor at the end of the permanent track

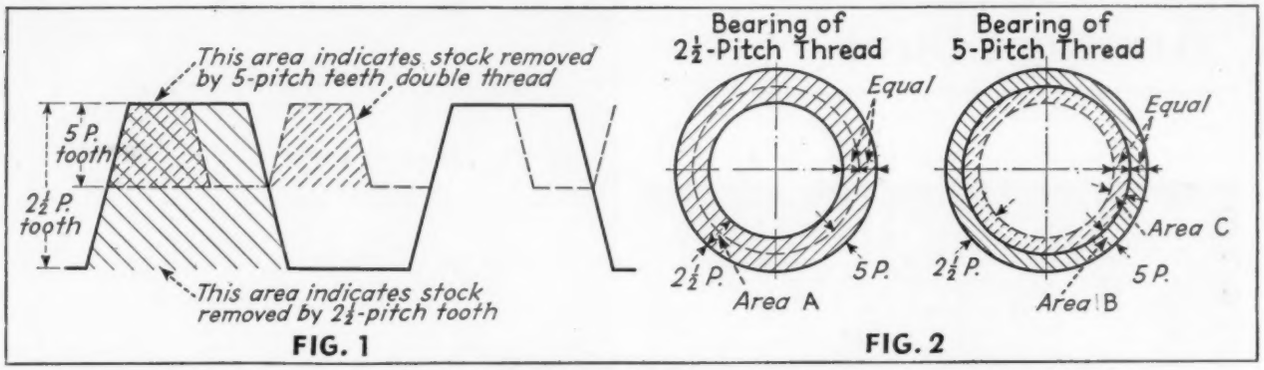


FIG. 1 FIG. 2

Fig. 1—More stock must be removed when cutting a single thread than for a double thread to meet like conditions. Fig. 2—A comparison of bearing areas shows considerable advantage in favor of the double thread

Double vs. Single Threads

O. E. KOEHLER

WITH a given lead and outside diameter, the problem often arises whether to make a screw of single or multiple thread. The single thread looks stronger because the individual teeth are larger, but analysis shows some facts that are not apparent at first glance.

Fig. 1 represents a 5-pitch double thread superimposed on a 2½-pitch single thread. Both screws have the same lead and the same diameter. The Acme thread illustrated is commonly used in leadscrews, feed screws and valve stems.

It will readily be seen that the single thread design is the weaker of the two. More metal has been removed from both the screw and the nut. This removal, in addition to weakening both members makes the threads more difficult to cut. For the single thread construction the screw has a smaller root diameter.

Fig. 2 shows cross sections of both screws to compare the respective bearing areas. Since the 2½-pitch thread is twice the depth of the 5-pitch thread it is obvious that:

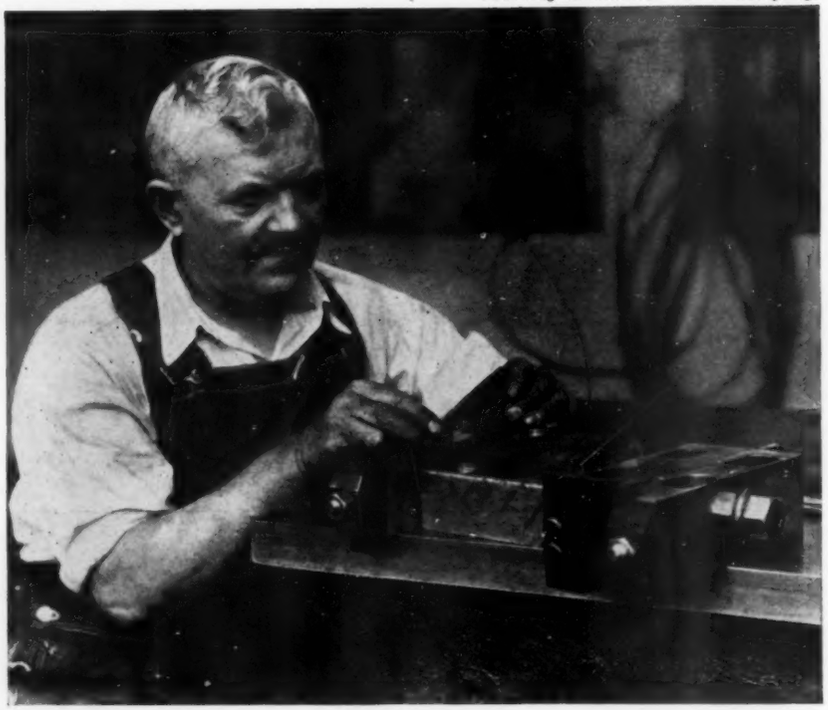
Area *A* equals Area *B* plus Area *C and*

Area *B* is greater than Area *C*

Therefore, twice Area *B* is greater than Area *A* and the 5-pitch double thread gives greater bearing area because of the larger minor diameter (in this case seventeen per cent more bearing).

Shims for Tool Setting

Courtesy Laminated Shim Company.

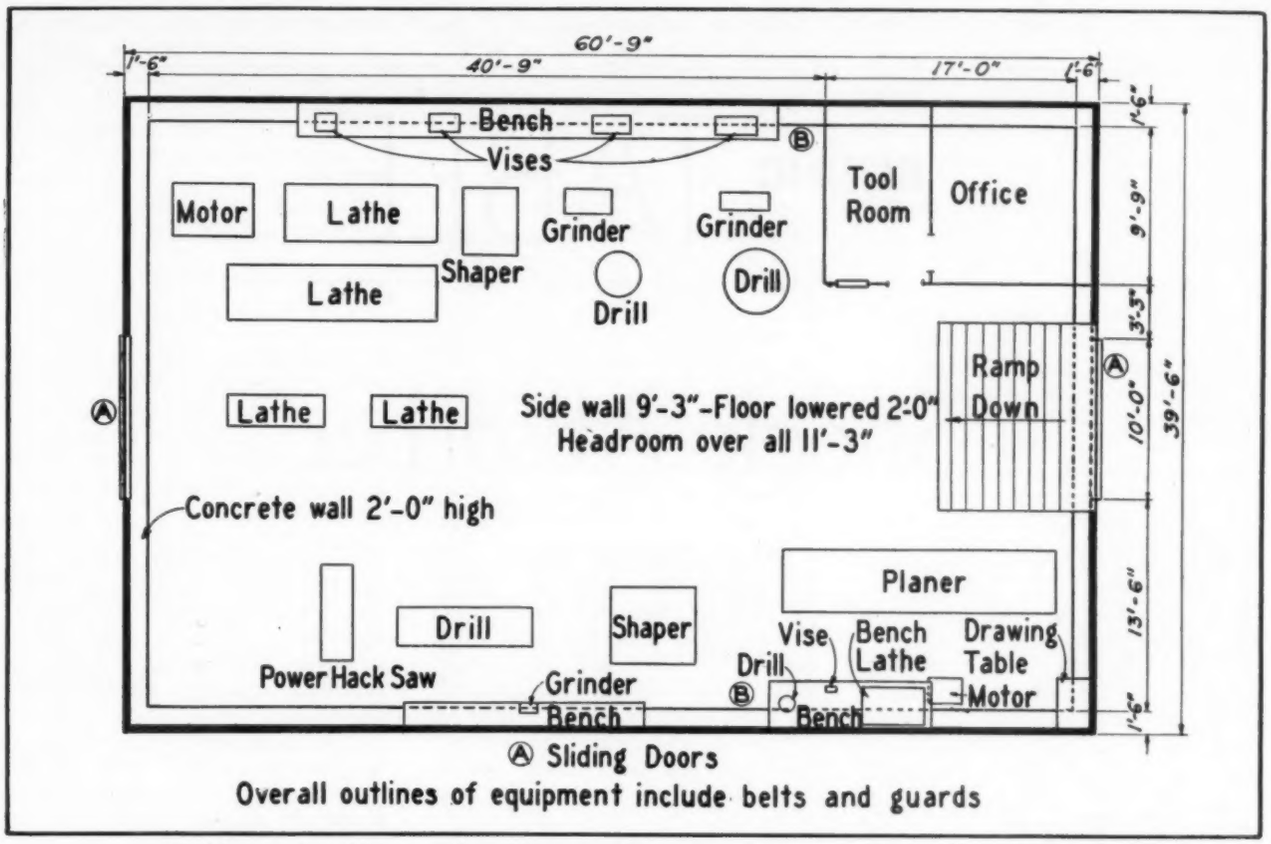


Spacing shims in a multiple tool set-up make it easy to make adjustments after the assembly has been placed in use

INSERTION of a laminated shim in the cutting tool assembly on automatic center-drive crankshaft lathes made by Wickes Bros. permits easy and accurate spacing of the cutting tools. These tool assemblies are made so as to give an exact dimension from one tool bit to other tool bits in the assembly in order to maintain definite spacing between the shoulders of the crankshaft bearings being machined.

It is frequently found after tools have been in use for some time that either a larger or smaller amount of stock is required on the crankshaft for the finish grinding operation. The laminated shim peels off for precision adjustment providing an easy method of changing the spacing.

After the tool assembly has been properly adjusted and tightly clamped together by means of the tie bolts no further adjustments are required until there has been a change in design or until it is determined that a different amount of grinding stock is required.



Equipment selected from surplus ordnance stock was arranged to meet the repair requirements of a huge job in an isolated community

A Shop in a Hurry

A machine shop for the 'Quoddy Power Project was erected and equipped ready for use in three months' time

PHILIP B. FLEMING
Lieutenant Colonel, Corps of Engineers
United States Army

A MACHINE SHOP problem had to be faced in the establishment of an engineer district at Eastport, Maine in 1935. The Eastport district was created to undertake the construction of the Passamaquoddy Tidal Power Project. Four engineer officers arrived at Eastport late in June, 1935 with a $36,000,000 job on their hands and with a completion date set two and a half years ahead. We realized the need of a large amount of plant and equipment to handle the job and with them the additional need of upkeep and speedy repairs.

There was no machine shop nearer than Bangor, 135 miles away, so we determined on one of our own. One officer was immediately dispatched to Rock Island Arsenal, Illinois, where our friends in the ordnance department assisted him in selecting from surplus sufficient machines and accessories to equip a complete shop. This was loaded on freight cars and started rolling down East.

At the same time we were advised as to floor space and overhead needed. We thereupon purchased a prefabricated building of these approximate dimensions. Finding it necessary to sacrifice required overhead to standard models and speedy erection, we met that requirement by sinking the floor two feet below sill levels. The building, incidentally, was erected in its entirety by labor recruited from the Passamaquoddy tribe of Indians who lived nearby.

This shop was in complete operation in September, 1935, and served a most useful purpose. It was a busy place, indeed in December, 1935 when our employment level had risen to nearly 6,000 men. It is at present being used by the National Youth Administration in their project at Eastport.

ROUND TABLE

Shock Absorber

"What's old Harry Weston doing out in the shop, Al? I thought he had quit working and retired to his garden patch some time ago."

"Yes, Ed, Harry had everything planned so he could live the life of Riley, but he's had some bad breaks and has to work for a living again. Most of his guaranteed mortgages blew up and, besides, he has a flock of in-laws to feed now. He needs all the cash he can get now to help out at home."

"So you're letting him shift his in-law burden to our payroll; why not pick out a younger man and give him a chance—there are plenty of them looking for work right now?"

"That's all too true, Ed. I'd like nothing better than to be able to find work for a dozen of them right now. However, they don't have the one thing that Harry has to sell—experience. He's done a lot of different kinds of work during his life and he can pitch right in on practically any job we have in the shop."

"I don't get you, Al. When I came through the shop he was running the old planer. There's a lot of younger men who could do that."

"Sure there are, Ed. You're making a good score today, but you don't seem to have the whole story."

"Maybe you'd better draw a picture for me then, Al."

"It looks like this, Ed. Harry is running the planer today; tomorrow he may be operating a miller or a shaper and the next day a grinder. I call him my shock absorber."

"What you call him doesn't mean much, Al. The thing I want to know is how he can make money for us. If he doesn't work any better than the shock absorber on my car he isn't much of an asset."

"This is somewhat different, Ed; you picked the wrong car. Guess I'll have to keep on reminding you of that. I've a darned good shock absorber in Harry and the arrangement is working out satisfactorily."

"How many times do I have to tell you to quit picking on my car? How can you take a man that is bound to be slow and make an asset of him—it doesn't add up."

"It's simple enough, Ed. We've

some good men running our machines, but most of them are specialists. They haven't had enough experience to help them start right in on a job that has to be done on a machine with which they are not familiar. Harry might be called a star performer on all the machines we have. There isn't a one of them that he can't call by it's first name."

"So what?"

"Every shop gets into production jams more often than we like to admit. We can't seem to keep the parts coming along uniformly. We wind up with too many pump bodies and not enough impellers, or we fall way behind in the shaft grinding operation. That's where Harry comes in. He can shift from one operation to another without batting an eye."

"He must shoot the costs up to the roof, too. He'll never be able to keep up with the younger men. Better do a good job in planning your work, Al. Then you won't have to worry about having a balance wheel to take up the slack."

"There you go again, Ed. You know darned well that no planning job can forsee all the problems that are bound to come up. As for keeping up with the younger men, I don't expect Harry to keep up with the specialists—although I've noticed that he doesn't take very much of their dust. He knows a lot of tricks that keep those young fellows on their toes."

Is Al's idea of using a jack-of-all-trades a good way to even up the output of different parts? Is he only making up for poor planning?

DISCUSSION

Wages Warranted

The question of paying men a yearly wage instead of a weekly wage is purely an economic problem. It is, however, just as sound as unemployment insurance or old age pensions. From the viewpoint of the worker, it is very attractive. It gives him the assurance of an income regardless of the condition of business. His mind is relieved of the uncertainty of unemployment and he becomes a better producer.

From the standpoint of the manufacturer, the yearly wage is just as attractive, although not so apparent. In the first place, the turnover of

labor will be less and the cost of breaking in new men will be reduced materially. The manufacturer will be compelled to plan his production over a yearly period rather than in the present hand-to-mouth method. —ROGER C. DICKEY
International Paper Box Machine Company

Beginner's Luck

A new employee should be given his job and proper instructions, invited to ask necessary questions, and then left alone. The foreman should indicate in a friendly way that he recognizes his feeling of strangeness, and that he will be tolerant during the first few days until the new man is acclimated. I have known men who, during their first few days or weeks of employment, appeared to be mediocre but, upon getting the feel of the job, turned out to be excellent mechanics. A probationary period of tolerance and good-will toward new employees is a good business policy.
—EMILE H. DION
Assistant Chief Draftsman
New Departure Division
General Motors Corporation

It always takes a new man a few days to find out where the tools and fixtures are located and to learn the peculiarities of the machines he is to use. Furthermore, a new man never should be put on a rush job during his first day at work. Just why Ed should expect a toolmaker to do a perfect job when working under pressure on his first day is beyond understanding. Barney's fault obviously was a too urgent desire to please and not the act of a slovenly workman.
—JAMES K. MATTER

Afternoon Pick-Up?

Al will lose nothing by installing candy machines in reach of factory and office workers during working hours. However, the plan in use here eliminates all chances and accomplishes the same results. The factory athletic club, aided and abetted by the factory management, conducts a small store in one corner of the main entrance corridor, serving both factory and office.

The attendant, one of the club officers, is permitted to take his noon lunch before the regular time in order that he can keep store during the noon hour. The store also is open for 15 minutes prior to starting time in the morning and after the whistle blows in the evening. This plan permits the handling of a few other conveniences besides candy, thus adding to the revenue of the club.
—H. R. HAGEMAN

Nearly all plants of any size have one means or another by which their employees can purchase refreshments. Where girls and women are employed, rest rooms usually are provided. So long as these conveniences are not overdone by the employees, they prove to be an asset to the company. At the plant where I am employed at present, the manager of the cafeteria goes through each shop with milk and soft drinks once in the forenoon and again in the afternoon. Also, the watchman at the gate handles a variety of bar chocolate and he makes one trip through the shop during the afternoon. In this way, the men do not stop work for more than five minutes and it was proven by a survey that the men more than made up the lost time during the next half hour. —H. A. GILLILAND
Hamilton, Ontario, Canada

Better or Worse

Most managements take the attitude that spoiled work is due, in most cases, to rank carelessness on the part of the workmen. They pay their employees for good work and expect to get it. Proper supervision and inspection can reduce scrap to the minimum. At the same time, consideration must be given to the class of workmen employed. In some shops, young men are taught to run a machine without any previous experience. They lack the touch of the trained man and are apt to have a high percentage of scrap. The skilled man, who sometimes makes an error, as a rule, never repeats. These men are the backbone of industry and should not be penalized for the rare occasion on which they scrap a piece. On the other hand, repeated mistakes should be condemned and penalized. —WM. W. BARNETSON

When a workman is engaged at a fixed hourly rate, the question of liability for spoiled work seldom is raised. When, however, he is employed in a shop where a system of payment by results is in use, it usually is a condition that premium payments are made only for parts accepted by the inspection department. At the same time, this workman is guaranteed his day-rate wage, free from any deductions.

The employer stands the loss of material and the cost of overhead charges, which in most cases are considerably greater than the value of the man's time on the job. This apportionment of the loss is equitable and acts as a deterrent in the case of men who are most concerned about the size of their pay envelope. —W. L. WATERHOUSE
Horfield, Bristol, England

Charging workmen for the time spent on spoiled work does not appear entirely sound. While it may cut down scrap to a certain degree, such a plan would disrupt other factors associated with economical production. First class workmen will steer clear of plants employing a plan of this type. The plan also would slow up production, since men would be handicapped by the constant fear of spoiling work. Another weakness of the plan is that it does not aid management in getting at the root of the trouble.
—PETER L. BUDWITZ

In larger industries, where a steady volume of work is constantly in progress under the careful inspection of trained men, spoiled work can be spotted and held in check. However, in the small plant where a workman's job changes often, there is always more or less spoiled work due to several human and mechanical causes. In my experience of 30 or more years, I can say that men are more valuable after a mistake is made, since they are on the watch and are careful not to let it occur again.
—CHARLES H. WILLEY

Don't penalize the workmen for spoiled work; blame his foreman! There is a reason for every scrapped part and it is the function of the foreman of a department to point out to the workman the cause of any trouble and how to avoid its repetition. Once the workman has been told what not to do by his foreman, any recurrence of spoiled work due to the same trouble should be the cause of a reprimand.
—D. J. F. GUTHRIE
Witton, Birmingham, England

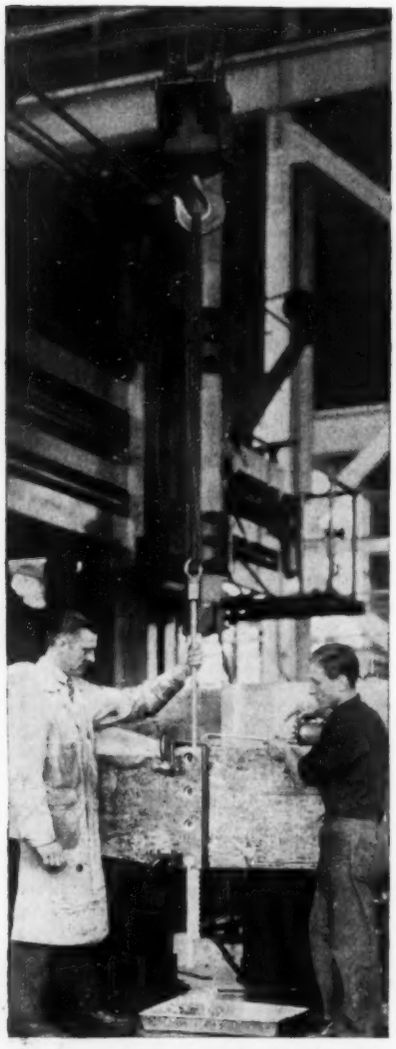
When a competent man is paid a fair wage for his work, his employer has a right to expect it to be satisfactory. If, on the other hand, the employer is paying poor wages and expects his men to work under poor conditions with poor equipment, he is entirely responsible for any scrap. He reaps just what he sows. —ARTHUR SILVESTER

IDEAS FROM PRACTICAL MEN

Keyslot Broaching With a 50-Ton Crane

F. P. TRICKEY
Production Assistant
Watertown Arsenal

The 18-ton assembly, part of which is shown in the illustration, contains a key slot that would usually be finished by scraping and fitting. To save time and improve performance it was decided to broach the slot. But, since the assembly was too big to be handled in a broaching machine or press, it was necessary to find some other means of moving the broach. The solution was to locate the shop crane, a 50-ton unit, over the work, and pull the broach through by means of a rope sling and draw bar as shown.



A bronze wedge fastened to the broaching tool provides a method of feeding it into the workpiece

The broach consists of two parts, a tapered, hardened, high speed steel body, and a bronze tapered wedge. The broach teeth are cut on one edge of the body and have a shear angle of about five deg.; the other details of the teeth follow conventional broach practice. The opposite edge of the body is ground to a taper of 0.002 in. per inch.

The bronze wedge, 6 in. longer than the steel body, also having the same taper as the body, is used as the expanding member to increase the size of the broach as desired. Notches in the body spaced 0.500 in. apart and keys in the wedge allow expanding adjustment of 0.001 in. per notch.

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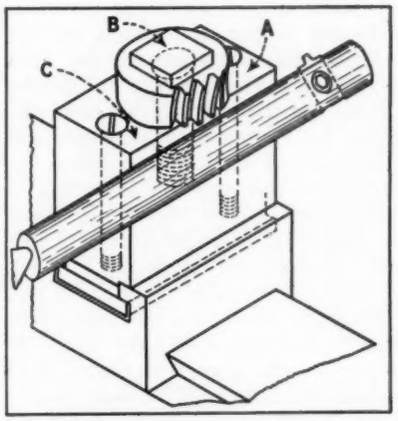
Wormwheel Cut With a Fly Cutter

J. E. MOORE
Department of Industrial Education
Wichita High School East

Here is an illustration of the method used by one of our former students for cutting a wormwheel, and to the best of my knowledge it was original with him.

The wormwheel for the threading dial on the lathe he was using was missing and he determined to make one to take its place.

The blank was turned to the correct size, the dimensions being taken from a similar lathe nearby. The number of teeth was stepped off with dividers and then prick punched. The blank was mounted on the block *A* in the compound rest so as to bring the center of its face to the center height of the lathe and was held in position by the screw *B*. A zero line scribed at *C* was used in connection with the prick punch mark for indexing. The fly cutter was ground to the correct shape, using the threads of the lead screw as a templet.



This improvised method of cutting a wormwheel is a good example of the ingenuity displayed by a former student in the industrial training department of a western high school

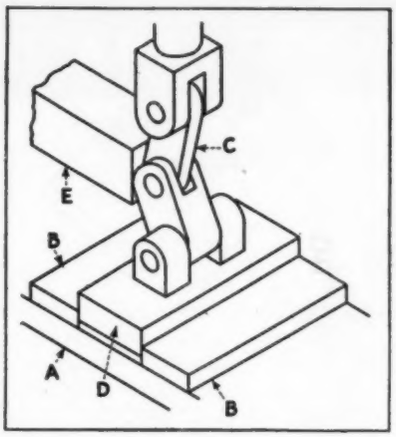
With one of the prick punch marks coinciding with the zero line on the block and the lathe geared to the same pitch as that of the lead screw, the number of cuts necessary to finish one tooth space were taken. The screw *B* was then loosened and the wheel was indexed for the next tooth space by rotating it until the next prick punch mark coincided with the zero line on the block and screw *B* was tightened. The tooth space was then cut in the same manner as the previous one, and the proceeding was repeated until the wheel was finished.

An Improvised Toggle-Press

CHESTER H. FRANKLIN

A small shop had a job which required the flattening of some small steel rods. The crank press did not give enough pressure to do the job, when used in the regular way. So one of the men made it into a toggle-press by the method shown.

A steel bed plate *A* has two guide strips *B*. The toggle *C* goes into the



Brass bar *E* is struck, thus straightening the toggle and applying pressure on the work between *A* and *D*

ram of the press while the steel lower plate *D* fits between the guides *B*. The press is set so that the space between *D* and *A* will be right when the toggle is straightened into line. Then the rods or wires to be flattened are put on the bed *A* with the plate *D* resting on the work.

Pressure is applied by a sledge at the back end of the brass bar *E*, which is long enough to extend back between the housings. A blow on the brass bar forces the toggle into a straight line and applies the necessary pressure to flatten the work. Such an expedient may not be applicable or advisable in many cases but it solved the problem for this shop on this particular job.

Simple Indexing Jig

HANS GALLANDT

The low-cost jig illustrated was made for drilling four equally spaced $\frac{17}{64}$-in. holes *A* in the body and four $\frac{3}{16}$-in. holes *B* in the flange of the work *C*. The jig was made of tool steel because the holes in the flange are so close to the body of the work that there was no room to put in bushings.

In operation, the work is slid in the bore of the jig so that the inner side of the flange is against the side, and is held by a headless screw. For drilling the holes in the body of the work, the jig is stood on edge and is indexed by successively turning it over for each hole. For drilling the holes in the flange, it is turned on its side so that the flange of the work rests on the drill press table. Drilling is done in a two-spindle drill to obviate the necessity for changing drills for the two sizes of holes.

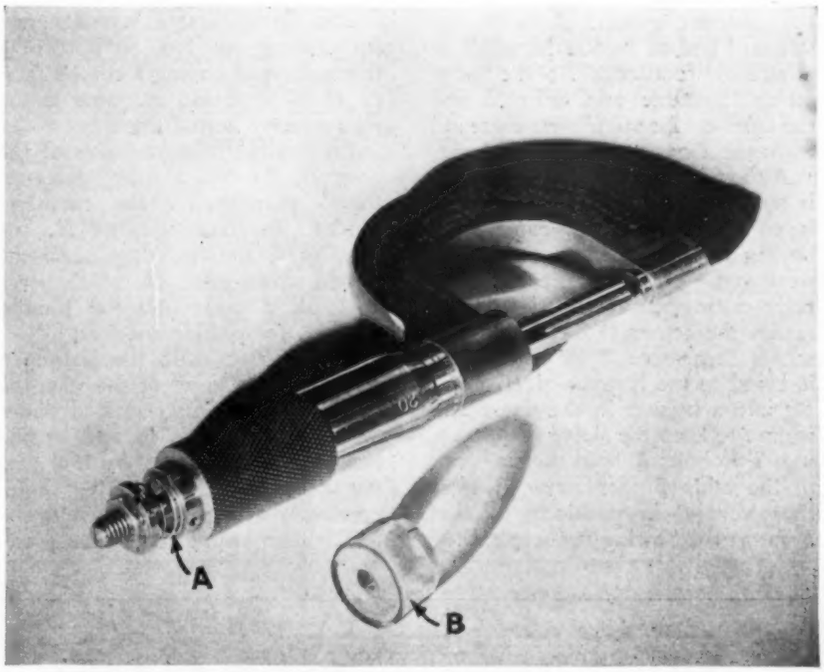
Ratchetless Micrometer

W. W. WERRING
Bell Telephone Laboratories

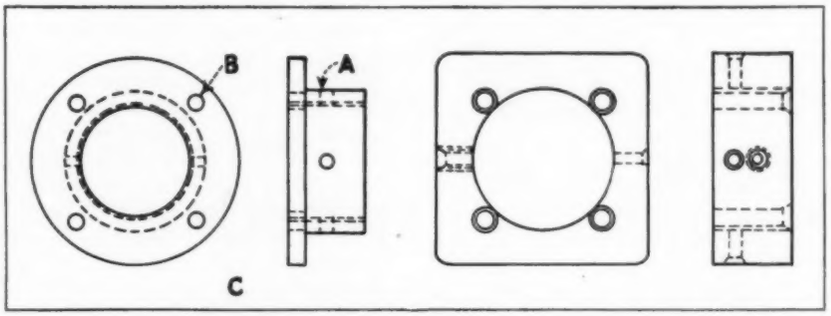
By substituting a light helical spring *A* for the ratchet commonly used on the micrometer, Bell telephone laboratories has recently been able to improve the accuracy of the instrument. The device does not depend upon friction for its functioning, since the torque of the user's fingers is transmitted entirely by winding the helical spring through a fixed angle. It has a member *B* that is rotatable independently of the thimble and is turned by the user. This member, instead of being in contact with the thimble, is connected to it by a light helical spring. The rotatable member is turned to bring the spindle into contact with the work and the turning continues until scribed lines on it and the barrel are brought into alignment. When these lines coincide, the helical spring has been given a predetermined displacement from its rest position and the proper amount of torque has been given to the spindle of the micrometer.

The device with its outer housing removed to expose the spring is shown in the illustration. To permit calibration and adjustment to give a definite torque, one end of the spring is attached to a washer that can be locked in any angular adjustment on the rotatable sleeve.

The instrument thus equipped is not only less subject to change in calibration than is the ratchet type, but it can be readily adjusted by merely removing the cover. This contrasts strongly with the calibration of the ratchet type micrometer which requires a series of cut-and-try operations, each involving disassembling and reassembling the ratchet, which is a tedious operation.



Instead of a ratchet, this micrometer has a light helical spring *A* that is wound through a predetermined angle by the torque transmitted to it by a rotatable member *B*



In drilling the body holes in the work, the jig is stood on edge and is indexed by successively turning it over for each hole

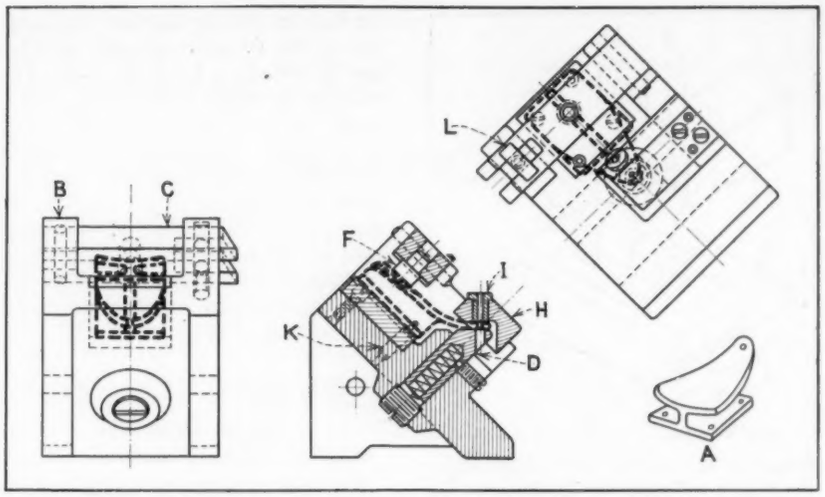
Overhung Footstock Increases Grinder Capacity

J. R. WHITTLES

Occasionally a piece of work is too long for any grinder in the shop. It is possible to increase the capacity of the machine by making a special footstock long enough to handle the work, with the base of the footstock bolted to the table in the usual manner. The illustration shows such a footstock with the center and sleeve overhanging the swivel table of the machine. It will handle a special job very efficiently and with very little expense. If the work is to be ground for its full length, a careful operator can turn the work end for end and match the ground surfaces providing he uses plenty of steadyrests.

Sometime ago we had to grind a wheel spindle 5½ in. longer than the capacity of the grinding machine in the shop. The bearings were within the range of the machine and the operator ground them to the standard size of 0.0002 in. small in a similar footstock. At the same set-up the table was swiveled and the taper on the spindle nose ground to fit the taper on the wheel sleeve.

Although a footstock of this type is not recommended for regular use, it will often save the expense of buying a new grinder or sending the work out. At *A* is the footstock body casting, at *B* the sleeve that carries the center *C*. Feed screw *D* moves the sleeve *B* in or out and is keyed to the handwheel *H*. Pin *I* fits into a keyway in the sleeve and is used to keep the sleeve from turning. Two bolts *K* hold the footstock to the table Binder screw *L* locks the sleeve *B* in position. Bracket *F* forms the bearing for screw *D*.



The apex of the work is pushed under the bushing and the work is located by two pins engaging holes in its base

Drill Jig for an Odd-Shaped Part

WILLIAM B. GREENER

The jig illustrated was designed for drilling one No. 30 hole in a triangular pad having a curved face, as shown at *A* and indicated in the jig by heavy dotted lines.

Essentially, the jig consists of the body *B;* the leaf *C;* the spring-actuated plunger *D;* the clamping plug *F;* the bushing plate *H;* the bushing *I;* the two dowels *K,* the turned down ends of which serve as locating pins; and the thumbscrew *L* for locking the leaf.

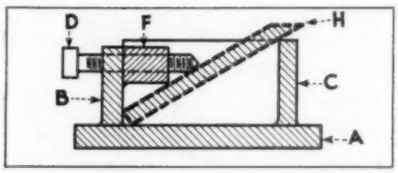
In operation, with the leaf open and swung back out of the way, the apex of the work is pushed under the bushing and is located by the turned down ends of the dowel pins engaging two of the four holes previously drilled in the base. The leaf is then swung down into place. Locking the leaf brings the clamping plug into contact with the work, holding it tightly, and causes the work to push the plunger down and support the apex by the pressure of the spring.

Fixture for Milling Bevels

JOHN E. HYLER
R. G. Le Tourneau, Inc.

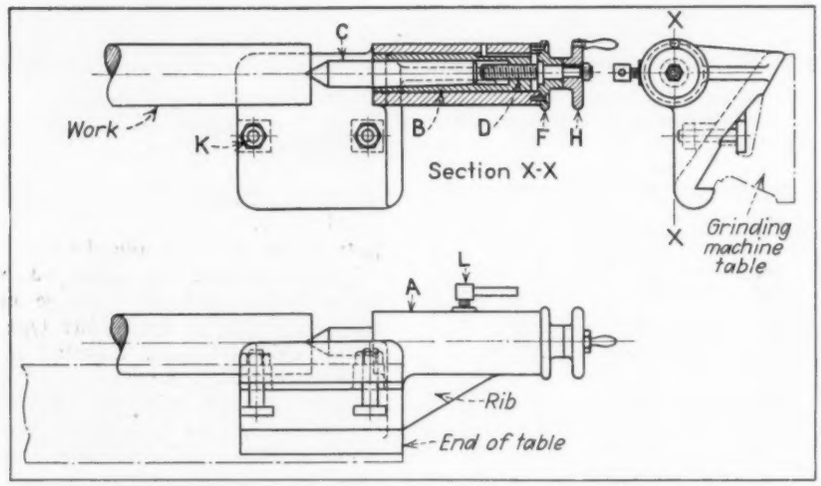
Fixtures of the type illustrated are convenient for milling bevels on the edges of flat work and can easily be made by welding.

The base *A* is a steel plate to which the sides *B* and *C* are welded, and should be wide enough to pro-



The angle of bevel is governed by the distance between the sides of the fixture and the height of the side on which the work rests

vide room for the clamps used in attaching it to the machine table. The distance between the sides of the fixture and the height of side *C* control the angle of the bevel to be milled. Dimensions of the fixture should be such that the pressure of the cut is borne by the side *C,* or toward the inside of the fixture from that point. The work *H* is held by the conically pointed screws *D* which are threaded through the tapped plate *F* welded to the side *B* and running the whole length of the fixture. Conical points of screws *D* should agree in angle with the slant of the work as held in the fixture.



A special footstock will increase the capacity of the grinder and save sending work outside

AMERICAN MACHINIST *Reference Book Sheet*

Chain Types and Strength

THERE ARE two general classes of chain—welded and weldless—although heavy-duty, large-size ($1\frac{1}{4}$-$2\frac{1}{2}$ in. wire diameter) power-shovel and dragline chain may have cast-steel links. The common circular-link chain is welded, either at the side or the end, by hand or machine (fire-welding or forge-welding) or electrically. More elaborate link shapes, for example door-operating chain, are usually welded, being an assembly of intricately locked formed links or of stamped and interlocked flat-steel links. The weldless types are almost all lighter-duty, specialized-service chains.

The American Society for Testing Materials recognizes two classes of welded iron and steel chain. The first is *crane chain,* for slings, hoists, steam shovels, and marine uses; it must be lap fire-welded. The second is *proof-coil chain,* for railroad cars, construction and forestry work, which normally can be either fire- or electric welded. Crane chain must be made of wrought iron free of foreign or bought iron scrap or steel, but proof coil may be made from open-hearth steel or all reworked scrap. Proof and break test loads for both types and nominal weights and dimensions are given in the table.

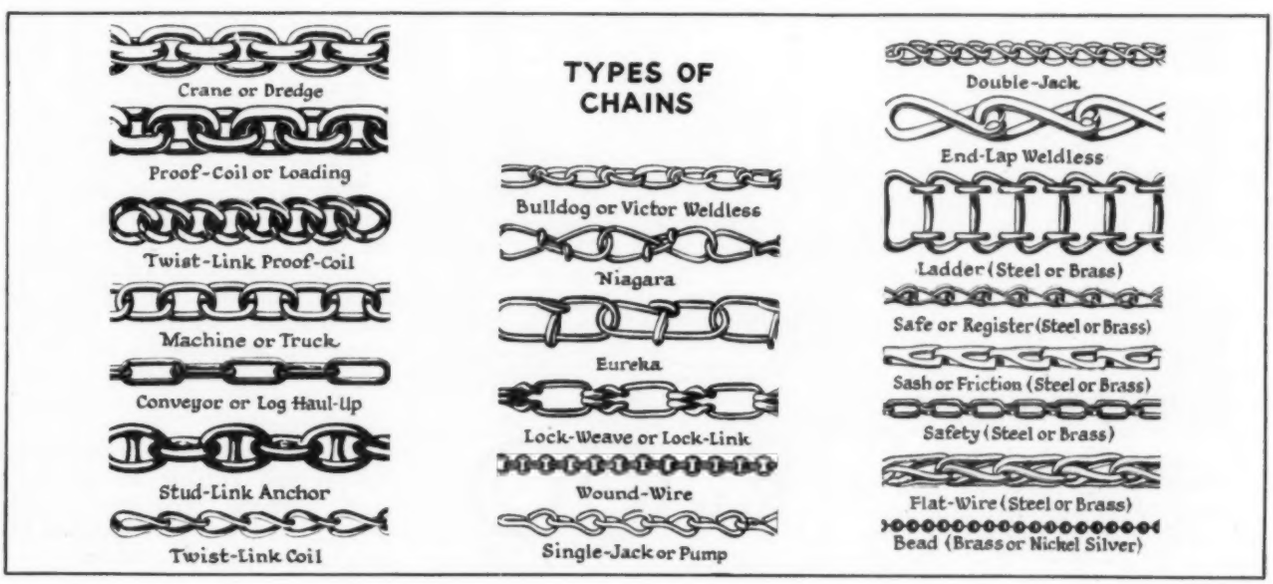
The Chain Institute has also set up certain definitions, cautions and instructions applying to chain. "Proof test" is applied in a standard chain-testing machine and shows the load in pounds which

Proof and Break Test Loads

Nominal Size of Chain Bar, In.	Proof Test Load, Lb.		Break Test Load, Lb.		Safe Working Load, Lb.	
	Crane Chain Wrought Iron	Proof Coil Iron or Steel	Crane Chain Wrought Iron	Proof Coil Iron or Steel	Crane Chain Wrought Iron	Proof Coil Iron or Steel
$\frac{1}{4}$	1 767	1 700	3 535	3 400	1 060	850
$\frac{5}{16}$	2 760	2 650	5 520	5 300	1 655	1 325
$\frac{3}{8}$	3 975	3 850	7 950	7 700	2 385	1 925
$\frac{7}{16}$	5 415	5 250	10 830	10 500	3 250	2 625
$\frac{1}{2}$	7 072	6 850	14 145	13 700	4 240	3 425
$\frac{9}{16}$	8 947	8 650	17 895	17 300	5 370	4 325
$\frac{5}{8}$	11 047	10 700	22 095	21 400	6 630	5 350
$\frac{3}{4}$	15 900	15 350	31 800	30 700	9 540	7 675
$\frac{7}{8}$	21 622	20 900	43 245	41 800	12 960	10 450
1	28 275	27 350	56 550	54 700	16 950	13 675
$1\frac{1}{8}$	33 400	.....	66 800	.....	20 040	.....
$1\frac{1}{4}$	41 250	.....	82 500	.....	24 750	.....
$1\frac{3}{8}$	49 900	.....	99 800	.....	29 910	.....
$1\frac{1}{2}$	59 350	.....	118 700	.....	35 600	.....
$1\frac{5}{8}$	69 750	.....	139 500	.....	41 800	.....
$1\frac{3}{4}$	80 800	.....	161 600	.....	48 450	.....
$1\frac{7}{8}$	92 750	.....	185 500	.....	55 300	.....
2	105 500	.....	211 100	.....	63 300	.....

Chain Weights and Dimensions

Nominal Length of 100 Links, In.		Nominal Weight per 100 Ft., Lb.	
Crane Chain	Proof Coil	Crane Chain	Proof Coil
86	100	78	70
100	111	115	105
109	123	166	158
122	138	220	210
134	150	275	265
156	175	350	335
169	188	430	410
188	213	615	580
225	250	820	780
256	275	1045	1000
288	...	1310	....
306	...	1600	....
363	...	1930	....
387	...	2335	....
425	...	2740	....
475	...	3180	....
525	...	3650	....
575	...	4100	....



AMERICAN MACHINIST *Reference Book Sheet*

Chain Types and Strength

the chain, in the condition and at the time it left the factory, has withstood, with load applied to a straight length of chain and at a uniform rate of speed represented by separation of the tester heads at not over 10 in. per min. The load at which the chain breaks, under this test, is the "average ultimate load." Safe working load, is the greatest load, in pounds, which should ever be applied to the chain. It is usually about half the proof load.

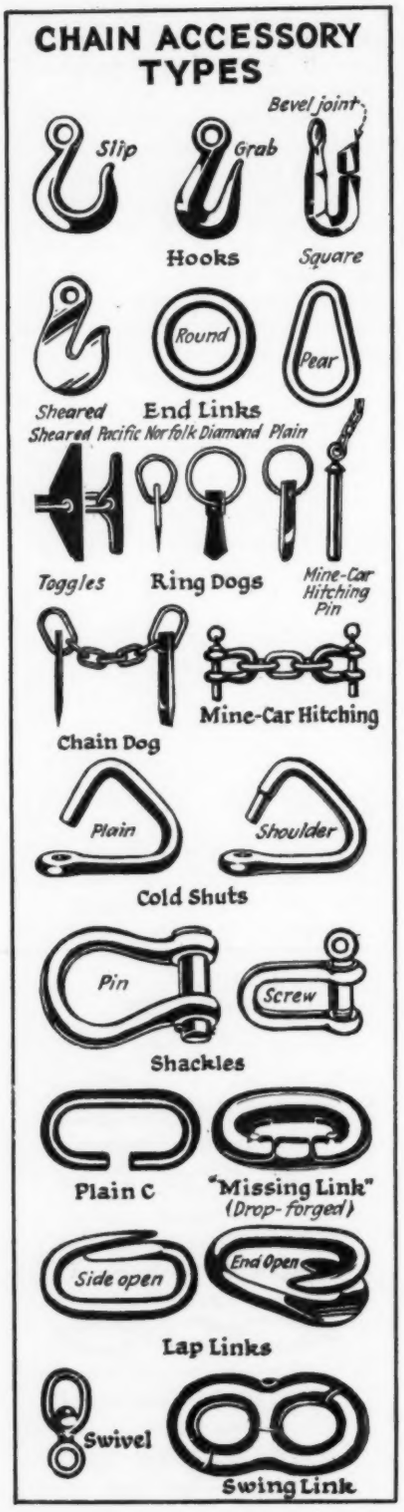
Any twisting, deterioration by strain,, usage, weather, lapse of time, or acceleration in the rate of application of the load, or variation in the angle of the load, will lessen the load that the chain can safely withstand. Where attachments, such as hooks or rings, are used with chain for sustaining loads, they must be of the recommended size, structure and materials.

Proof coil chain finds the greatest number of uses. Common sizes are $\frac{3}{16}$ to $1\frac{1}{2}$ in., the $\frac{3}{16}$ supporting about 525 lb. and the $1\frac{1}{2}$-in. 27,200 lb. safe working load. This may also be supplied in the "twist link" form, in which each link is bent or twisted 90 deg. across the middle, making the chain operate better and more smoothly over blocks.

Two variations are the "BB" and "BBB" grades. They have shorter links simply to give greater strength and durability. While proof-coil $\frac{3}{16}$ will have $12\frac{1}{2}$ links per foot and weigh 40 lb. per 100 ft., the "BB" grade has 14 links and weighs 42 lb., and the "BBB" $15\frac{1}{2}$ links and weighs 43 lb. Thus safe working load of the "BB" grade is 580 lb., and of the "BBB" 650 lb. in the $\frac{3}{16}$-in. size.

The next step up to a stronger chain is "loading" chain, which in the $\frac{3}{16}$ size has 17 links per foot and weighs 50 lb. per 100 ft. The electric-welded chain of this type has a safe working load of 1,000 lb.

Heavy-duty dredge or crane chain is designed to withstand high tensile strains, severe shocks, abrasion and to be absolutely safe wherever



human life is at stake. Nominal sizes are $\frac{5}{8}$ to 2 or $2\frac{1}{2}$ in., in one make the $\frac{3}{8}$ running $11\frac{3}{3}$ links per ft., weighing 167 lb. per 100 ft. and having a safe working load of 2,700 lb., while the $2\frac{1}{2}$-in. has $1\frac{11}{16}$ links per ft., weighs 6200 lb. per 100 ft., and has a safe working load of 104,400 lb.

Similar in shape, but with longer and more-open links is "passing link" chain, in trade sizes from 1/0 to 7/0, with bar stock of 7-gage to $\frac{5}{16}$ in. Conveyor or log haul-up chain, normally available in sizes from $\frac{1}{2}$ to 2 in., is very open link, in the $1\frac{1}{2}$-in. size, for example, having 8-in. links and weighing only 1,750 lb. per 100 ft. Here the effort is to get an exact number of links per foot rather than to get maximum strength from the chain, so there may be two or three link lengths made from the same diameter bar stock to suit various conveyor set-ups.

Another form of link chain is the stud-link anchor chain commonly used in marine service, like the other types but including an additional center spreader bar or stud link to give added strength. $1\frac{1}{2}$-in. chain of this type, for example, will withstand a breaking test of 131,488 lb.

All sorts of sling chains, harness chains, and other specialized forms are made up from these simple chain types, the name in each case designating the end or other fittings. For example, sling chains have either a hook on one end and a ring on the other, or two rings.

There are many special shapes of repair or replacement links, from the open "C" link for temporary repair to the open-lap (side or end) links for fire welding. There are also cold-shuts, which are links incorporating an eye and a pin which can be riveted cold, malleable-iron 2-part connecting links, and various types of shackles.

Weldless chains vary with manufacturer and purpose almost endlessly, although there are several commonly known types sketched in an accompanying illustration.

Buildings which house the Engineering Fair at Leipzig were this year increased in number and capacity. Two new halls were erected and two existing halls enlarged. All work is being done in accordance with an extensive plan to make the exhibition grounds more beautiful and fitting for their purpose of promoting international industrial trade

300,000 Visit Leipzig Fair

Engineering Fair for 1938 marks Germany's industrial progress and includes a larger number of foreign exhibitors

LEIPZIG—In the midst of momentous political developments in central Europe, German industry recorded another year's progress at the annual Leipzig Engineering Fair, held this year March 6-14. Previous figures for attendance, number of visitors, and number of exhibitors were surpassed. Of the 300,000 persons attending the Fair, 32,500 were from foreign countries representing a substantial increase in attendance from outside the Reich.

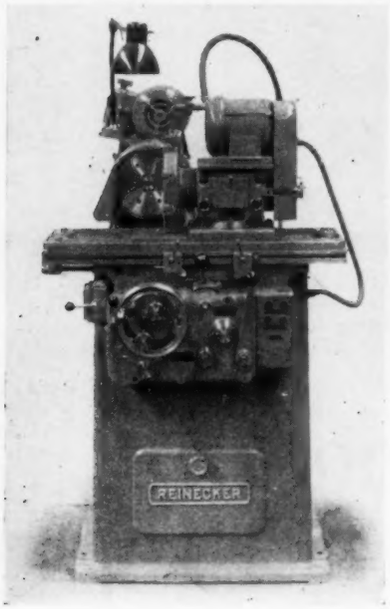
In the Engineering Fair alone were 3,308 exhibitors who occupied 828,000 sq. ft. of floor space as compared to an area of 656,000 sq. ft. in 1937. The additional area was made available by new Halls 20 and 21 and by enlarging Hall 14 and the Palace of Electrotechnics. Over 5,000 machines were shown at the Engineering Fair of which 521 were machine tools.

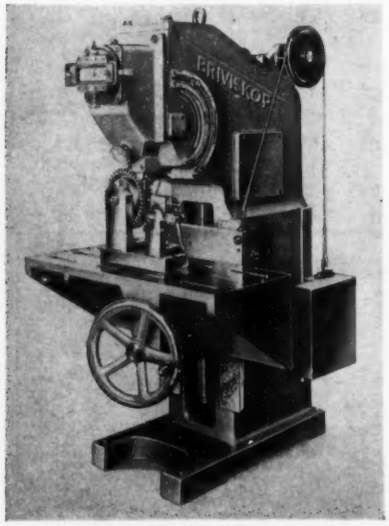
In the machine tool exhibit the trend toward higher cutting speeds was pronounced. This trend was caused partly by the increased use of light metals and partly by the attempt to reduce the number of finishing operations by the use of high speeds and fine feeds. To obtain these feeds, special attention was given to automatic means for lubrication and supplying coolants.

Mechanically controlled drives were more prominent than those hydraulically controlled. Most machines were equipped with individual motors with horsepower ratings stepped up above previous years. The use of infinitely variable

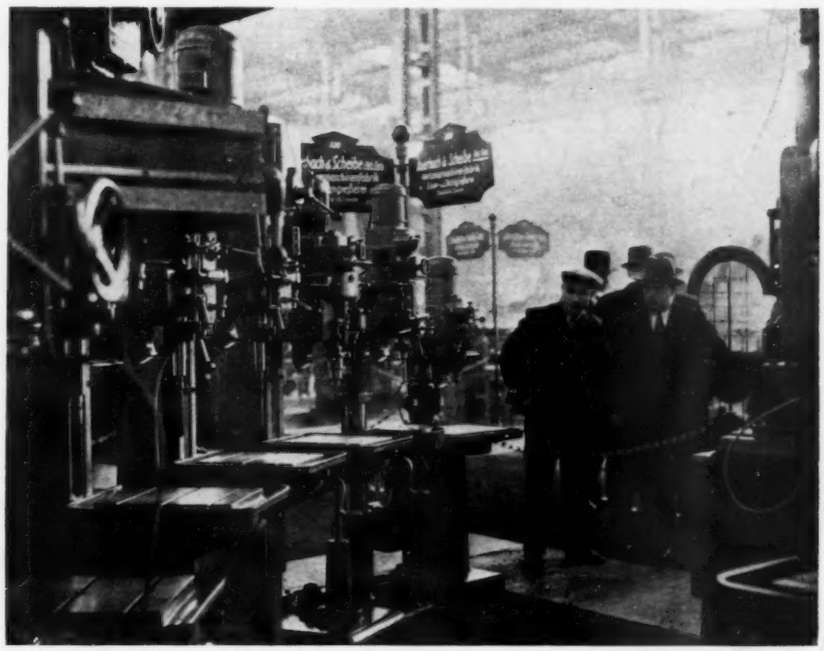
Raboma Maschinenfabrik, Berlin-Borsigwalde, featured an improved method of clamping on its line of radial drills. Clamping the saddle and column is synchronized by an electro-hydraulic device controlled from a push-button in the center of the adjusting handwheel. A separate arm clamp is interlocked with the elevating mechanism

A face grinding machine, developed by J. E. Reinecke, A.G., Chemnitz, is designed particularly for grinding the faces of collars, round nuts and similar workpieces, and for sharpening pinion-type gear cutters. A single lever controls the whole machine. Longitudinal feed to the work table is hydraulic. The infeed motion is independent of the table movement and may be controlled by hand or by hydraulic action. The magnetic chuck is 200 mm. in O.D.





The Briviskop shown by Georg Reicherter, Esslingen, may be used for either the Brinell or Vickers hardness testing. This machine gives a highly magnified image of the impression, at the front of the machine, which can be precisely measured across any of its diameters. Loading ranges are exceedingly wide but may be set simply and visibly in spite of this. Loading speed is set by simple screw adjustments arranged in connection with an oil brake. Clamping pressure is adjustable so that delicate pieces can be held without danger of damage, and on the other hand, bulky and overhanging work may be clamped with a force sufficient to hold it securely during the test



A busy place during Fair week was Hall 9 which housed the machine tool exhibits. Altogether 521 machine tool builders displayed their products, most of them set up for actual operation. Foreign attendance was 12 per cent above 1937

drives has considerably increased.

Further steps have been made in the elimination of waste time by centralizing control levers and applying brakes to the spindles when the machine is stopped. Because the higher speeds increase the volume of chips to be handled, beds and tables have been protected either by covers or by some other means. One manufacturer inclines the bedways so the chips will fall off.

Emphasis was placed this year on the exhibits dealing with new engineering materials. These show improvements in quality and also the development of materials to replace those which are limited in quantity in Germany in accordance with the Four-Year Plan. Outstanding in the materials exhibits were:

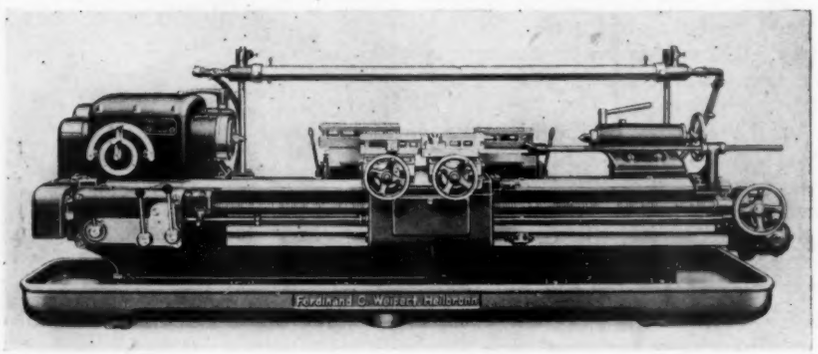
1. Increased applications of light metals, magnesium alloys in particular.

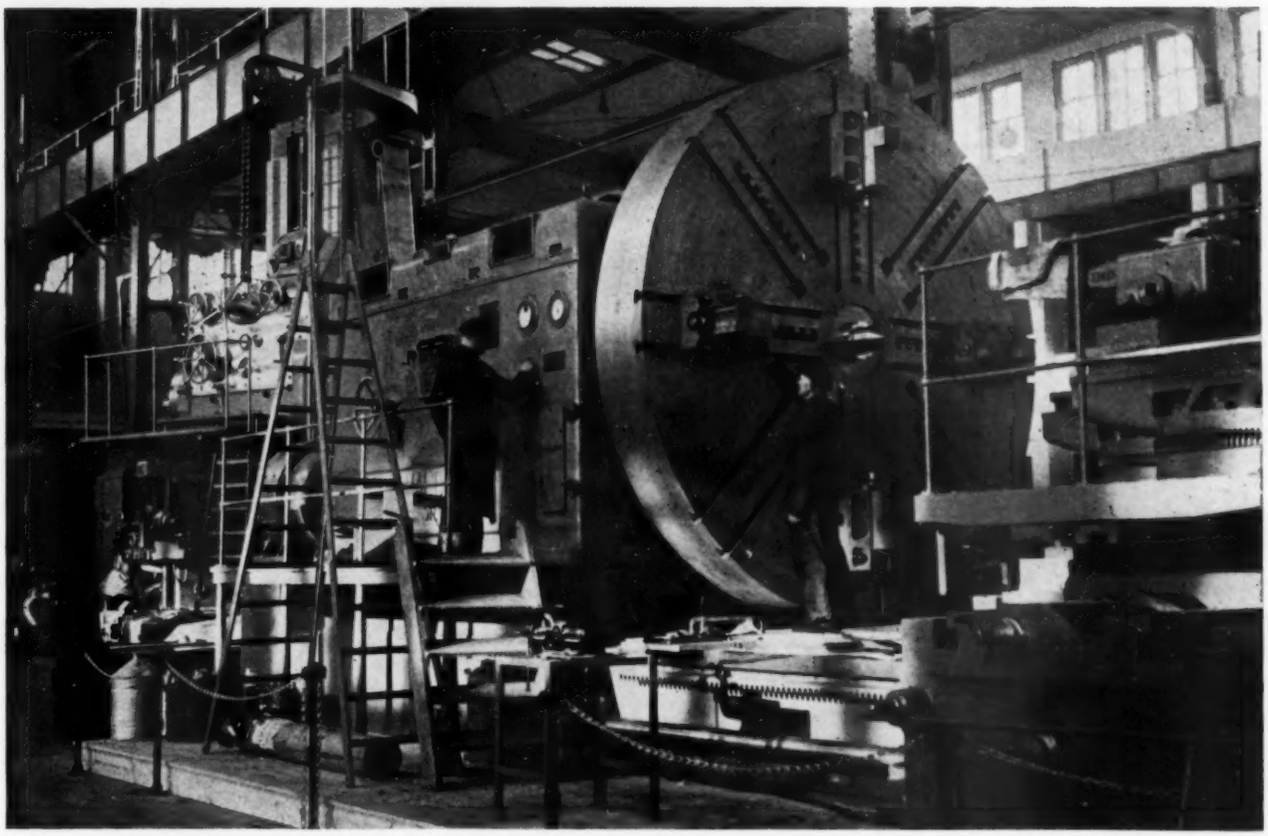
2. The development of plastics and the equipment for molding them.

3. New uses of steel construction, especially designs employing light sections fabricated by welding.

4. Wider uses for die castings in-

A semi-automatic multi-cut lathe made by Ferdinand C. Weipert, Heilbronn, has two saddles with cross slides, one for longitudinal turning and the other for transverse machining, so arranged that they can operate entirely independently, even with different feeds. Automatic tripping of the longitudinal and transverse power movement is likewise independent. Cutting speeds and feeds may be quickly adjusted while machine work is in progress. On completion of the machining cycle the tools are automatically returned by rapid traverse to the starting position. Here again longitudinal rapid traverse is independent of the transverse rapid traverse. The machine is especially adapted to production work such as motor shafts, axles and flanged bearings

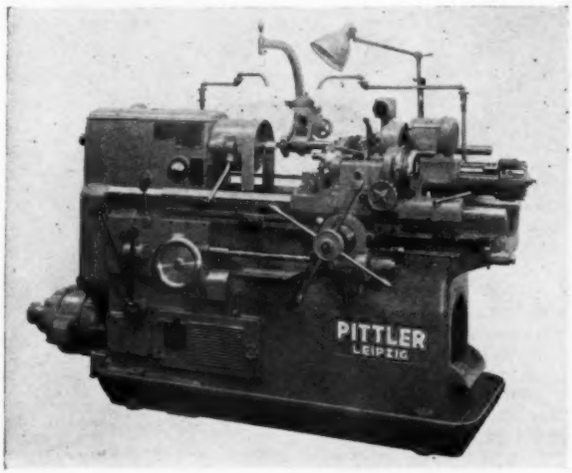


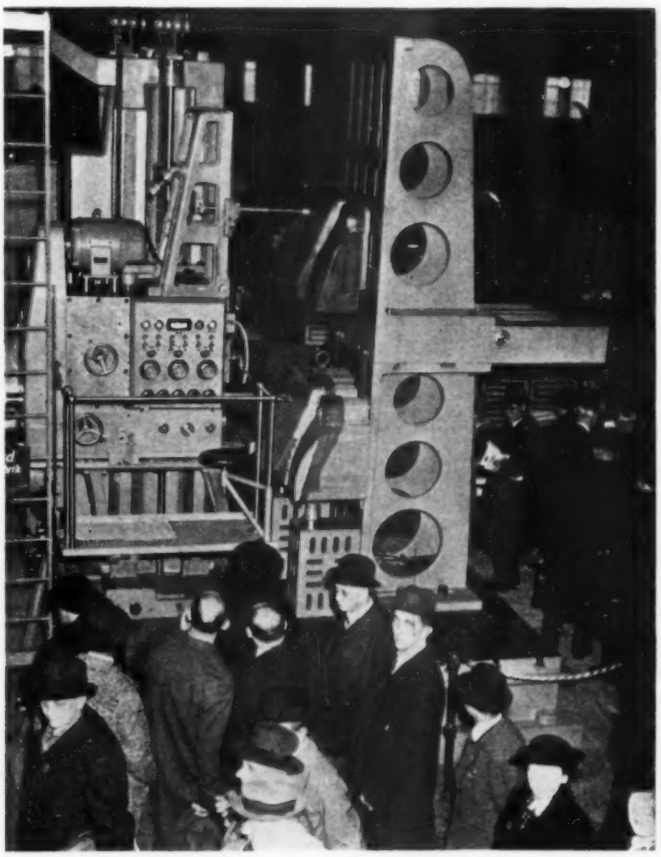


The largest machine displayed at the Fair this year was a huge turning lathe, built by Waldrich, Siegen, the faceplate and carriage of which are shown. This machine will swing workpieces 13 ft. in diameter over the bed and 11 ft. 2 in. over the tool slide. Temperature of the main bearings is automatically controlled; if they become overheated, warning lamps light up. The machine is driven by a 140-hp. d.c. variable speed motor and weighs 280 tons

Collet & Engelhard A.G., Offenbach am Main, showed an electrically controlled profile miller. This machine automaticaly reproduces a pattern from a feeler arm which passes over the model and transposes its movement to the work spindle by means of an electrical mechanism. Another machine made by the same company is able to reproduce work by following a drawing by the use of a light beam and a photocell

Among the new machines displayed by Pittler Works, Leipzig, is a turret lathe for bar work up to 45 mm. diameter, driven by a flange motor. The roller bearing spindle is driven by V-belts without the use of gears. Both longitudinal and cross feed can be adjusted during the operation of the machine by turning a hand wheel. High operating speeds of this machine make it suitable for turning brass and light metals

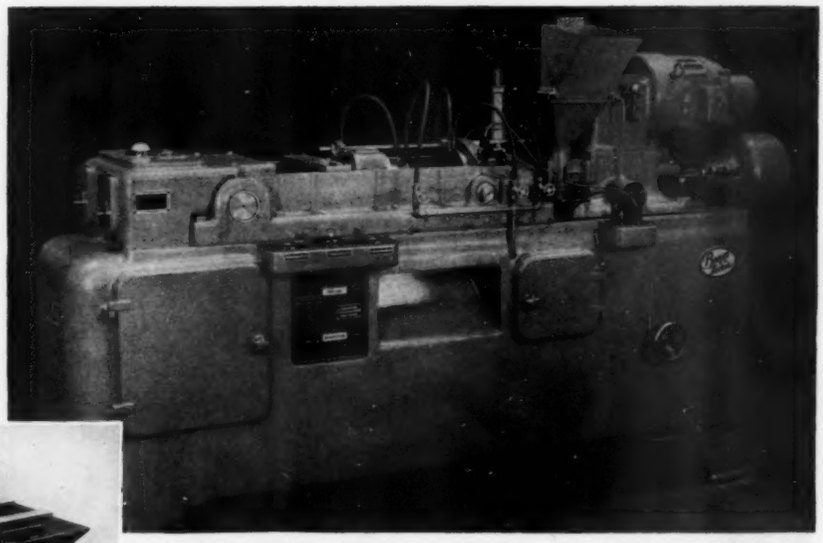


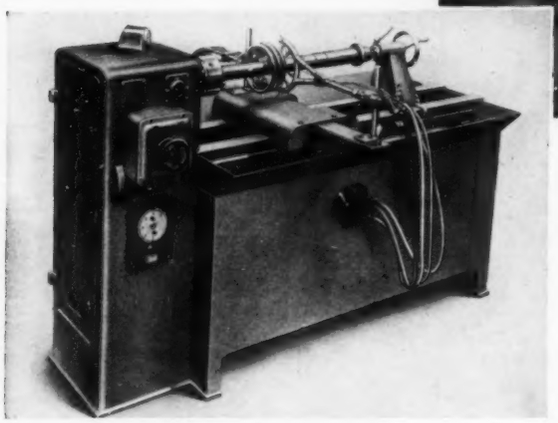


cluding exhibits of pressure die casting machines.

5. Centrifugal castings including the combination of two metals, such as steel and brass, by this process.

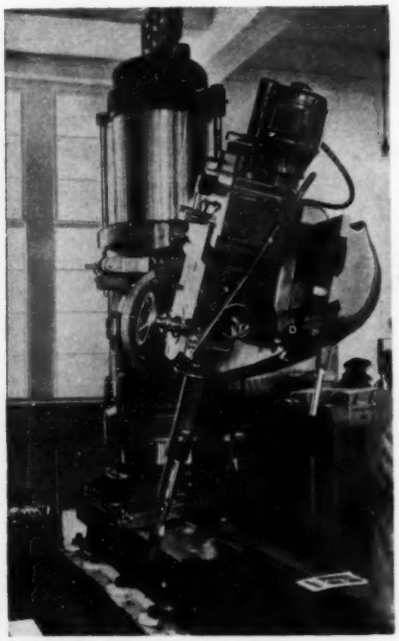
In connection with the materials exhibits, methods of processing that involved improved technique were shown. Notable among these was further development of gas welding and cutting, and new methods of heat-treatment, particularly flame hardening.



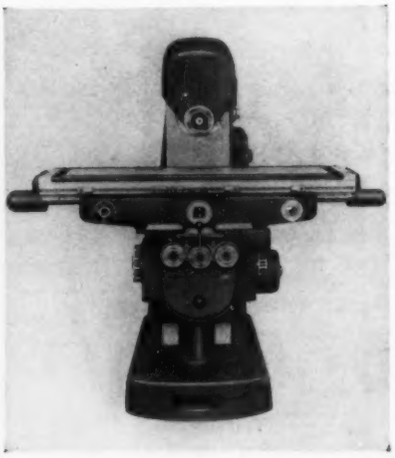


A shaft hardening device was displayed by the firm of Griesheimer Autogen Verkaufs, of Frankfurt am Main. It consists of a ring of heating burners and a double ring of quenching nozzles surrounding the shaft. A fully inclosed control box regulates the rotation of the shaft and the feed of the hardening device

Franz Braun, Zerbst, showed a new design of the "Isoma" injection molding machine for use with plastic materials. The complete cycle of the machine is controlled by two clocks, one of which determines the interval during which the piston exerts pressure on the material and the second regulates the time the mold remains open. A special construction accurately controls the amount of material fed into the machine for each injection and eliminates both overloading and short feeding

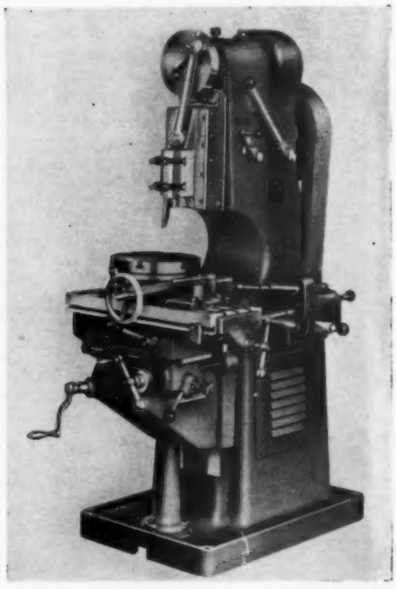


A line of radial drilling machines shown by Ateliers GSP, Paris, consists of three models equipped with three different types of saddles according to their capacity. Spindles are driven by flange motors with vertical shafts and dynamically balanced rotors in order to eliminate vibration. Another flange motor mounted on back of the arm provides elevating motion. The twelve or eighteen spindle speeds and the six or eight feeds are obtained by chrome nickel heat-treated sliding gears. Speeds are controlled by a single lever, combined with a device for reading the diameters to be drilled at various cutting speeds. A special mechanism protects the machine against overload when power feeds are engaged. This exhibitor also showed Cincinnati centerless grinders and milling machines



A feature of the knee-type milling machine offered by Biernatzki & Company, Chemnitz, is the centralized control mechanism. The operating scale is provided with arrows indicating milling directions which can be obtained by the movement of a single lever. The use of different colors and type faces on the scale and dials make machine control easily understood even by unskilled workmen. Either oil or water cooling, or both together can be provided in this machine. A single lever regulates the change from oil to water

The vertical slotter displayed by Roscher & Eichler, Altmittweida, was designed to improve the production and precision of this type of machine. An arrangement for inclining the ram makes the machine particularly suitable for cutting taper keyways and producing draft in blanking and piercing dies. Compound motion of the table makes it possible to cut any profile from a templet. The ram is provided with a clutch by which it may be instantly stopped in its extreme upper position. The standard machine is fitted with power feeds both cross and longitudinal and with adjustable stops arranged to trip the feed automatically



NEWS OF THE INDUSTRY

Unions, Encouraged by Court Decisions, Are Preparing for New Big Drives

With the Inland ruling to go on, labor leaders declare fewer strikes and more agreements will be their objective

FRANK RISING
Labor Editor

The unions are preparing to march again. They have bivouacked through the long winter's depression, have slicked up their administrative and organizational set-up, and will press again toward two goals. The first goal is to consolidate their gains by demanding signed contracts in every plant where elections have been won. The second is to organize employees rapidly wherever business conditions are picking up.

Two notable decisions have influenced the unions toward action. One is the Supreme Court decision that municipalities cannot use their licensing power to stop distribution of pamphlets and circulars; the other is the NLRB ruling in the Inland Steel case that signed contracts are the proper result of agreement between employers and employees in collective bargaining.

Other Morale Builders

Two other recent decisions also are going to be used by the unions to build morale. They are the Republic Steel and the Globe Cotton decisions. The Globe case was similar to the Inland row, and the ruling is the same: if the union shows a majority, it is entitled to a signed contract after agreement. The Republic decision is notable not because of the line it took (dozens of others have resulted in the same orders to disband company-favored unions and reinstate discharged employees), but because of the size of the company and the fact that to most people Republic represented the employer "front" in the Little Steel strike las year.

Leading off in the organization drive will be two of the biggest groups in the Committee for Industrial Organization camp, the Steel Workers Organizing Committee and the Textile Workers Organizing Committee. And the prospects are that smaller C.I.O. and American Federation of Labor unions will follow up. The union leaders say that, with the Inland decision to go on, fewer strikes and more agreements should come out of the drive.

Further Court Contests

oth Inland and Republic plan to carry their cases as far as they can in appellate courts, and future Supreme Court tests are possible. Union strategy differs in the two cases. At Inland the S.W.O.C. has been certified as the majority bargaining agent and will press with all power for contracts, but at Republic it is not in a majority position. Consequently word has gone out to organize Republic, but to avoid any violence or strikes.

The steel organizers and union field executives now in the field are better-trained than they were last year, and several important changes have been made during the winter, whereby inexperienced and inept operators have been replaced by older, wiser heads. They plan to develop their campaign carefully and slowly, using their pamphlet - distributing power to plaster the steel towns with publicity of all kinds as needed. Organization will be pushed into plants operated by Youngstown Sheet & Tube, Bethlehem, National Steel, Armco and others. But the public will see no fireworks, at least for months, because "good public relations" is a point the unions are striving for—which differentiates 1938 from 1937.

There are several factors which will have an influential bearing on the 1938 unionization campaign. Foremost is the general condition of business and next is the rise or fall of peace negotiations between the C.I.O. and A.F.L. Another factor is labor legislation, and still another politics in general. Roughly, these are listed in the order of their importance at present; and continuation of the depression will mean that the unions will seek contracts based on the *status quo* rather than on any advanced position. So the outlook from that angle is for more peace and quiet than in 1937.

On the battle-front between the C.I.O. and A.F.L. there is little firing today, save in Pennsylvania where State politics and the scrap between rival metal-working groups is red-hot. Taking the membership of each federation broadly, a large majority of the rank-and-file people want to see the inter-union quarrel end this spring, and there is a chance that it will be patched up. If it is not, the C.I.O. will hold a national convention in the fall, adopt a constitution, elect national officers, and divide responsibility industry by industry under separate executive committees.

In Washington, consensus among observers today is that there is little chance for new labor legislation. Two bills are up for Congressional consideration—the wage-and-hour bill and Senator Wagner's bill to make all firms doing business with the government conform to the National Labor Relations Act. The pull and tug of proponents and opponents of each are nicely balanced. Prospects are that the bills will suffer no lasting setback but will be put off until the next session.

Union Political Efforts

Meanwhile, Congress wants to go home (which is another reason for not expecting action on controversial labor subjects), and the national elections are but six months away. As a sideline to economic effort, the unions in both the C.I.O. and the A.F.L. are entering politics in a larger way this year, and will try to line up the labor vote in State contests as well as in the battle for Congressional jobs. The craft unions and industrial unions will be opposed to each other in some of these contests, while in others they will join hands. In the

U. S. Steel officials at board meeting—(Left to right) Edward R. Stettinius, Jr., chairman of the board of directors; Myron C. Taylor, the retiring chairman, who remains as a member of the board; Benjamin F. Fairless, president; and Enders M. Voorhees, chairman of the finance committee

final analysis, their family fight will tend to cut down the present overwhelming Democratic majority in Congress, and may elect conservatives in some quarters.

For the average business man, wondering what to expect from labor in the coming year, the outlook is better than in 1937, but still is tough. One movement now under way can change the pattern tremendously. That is the effort being made by Edward F. McGrady, former assistant secretary of labor, to bring the big labor leaders and a group of big industrialists together for a truce. If his plan succeeds a drive for self-control and mutual consideration of economic programs *outside* of the political sphere may develop.

Barring such a movement, the coming months probably will bring union action in a much more coordinated form than was witnessed last year. This time the white collar drives are being shaped up to lend support, and this time the rank and file are listening closely to the older heads at the top of the unions. If they continue to listen, they will demand all they can get on the basis of the new court decisions—which is plenty.

Welding Wire Output

NEW YORK—Production of steel welding wire in 1937 amounted to 155,310,000 lb., an increase of 10 per cent over the year before, according to the American Iron and Steel Institute. The 1937 output was 545 per cent ahead of 1932 production, and has expanded more rapidly than the total production of steel, which was but 275 per cent.

Revamping of U. S. Steel Outlined by M. C. Taylor

NEW YORK—Having completed a 10-year program of modernization and rehabilitation of the corporation's plants and of reorganization of the corporation's general structure, Myron C. Taylor has retired as chairman of the board of directors of United States Steel Corp. He has been succeeded by Edward R. Stettinius, Jr., heretofore chairman of the finance committee. Benjamin F. Fairless remains as president of the corporation and becomes the chief administrative officer.

Mr. Taylor's final report reveals the details of one of the most amazing revamping programs ever undertaken by any company. He points out that the corporation's physical properties have been so largely made over that "of the production in 1937 scarcely one-quarter was of the same composition or made in the same fashion as the production of 1928." On top of that statement it is not surprising to learn that in the past 10 years the corporation spent $562,569,358 for additions, betterments and modernization. Main objective of that spending program was not expansion, but increased efficiency.

Discussing the revolution in steel making, Mr. Taylor comments that the industry has been transformed almost overnight from a rough industry into a precision industry. The effect of mechanization has been to revise the rates of pay upward. "Steel making today," says he, "requires a large amount of skilled labor and comparatively little unskilled labor. Former unskilled workers have, on the whole, been absorbed as skilled workers. Given normal conditions and normal earnings with which to finance obsolescence and expansion, the industry will in the future do more than its share in providing good jobs."

Average age of corporation employees is about 40, with the bulk between 30 and 50, according to Mr. Taylor. The number of workers between 55 and 60 slightly exceeds those between 20 and 25, and there are more employees between 65 and 70 than there are below 20 years. Recognizing a threatened future shortage in skilled workers, Carnegie-Illinois has brought into being a plan for apprentice training which is really in the nature of an industrial university.

Metallurgy and research now rank with production, sales and finance as major divisions of the corporation, Mr. Taylor reveals. At the close of 1937 the corporation had 174 labortary departments. Most of them are for metallurgical control which is an essential part of today's steel making. Others work on problems of customers. Still others are experimenting with materials for new uses or searching for new uses for materials already in existence. A few are in pure research. An idea of the scope of work may be had from the fact that the item of metallurgy and research cost $8,400,000 in 1937.

In 1932 the Corporation planned to separate the making and selling of steel from the financial administration, but events necessitated the postponement of carrying out that plan until January, 1938, when operating control moved to Pittsburgh.

WATCHING WASHINGTON

R.F.C. industrial loans are not expected to make a big stir . . . Avalanche of applications likely to come from companies which are near or below credit margin . . . No wages-hours legislation looked for . . . Merchant marine program progressing

McGRAW-HILL WASHINGTON BUREAU
(Paul Wooton, Chief)

WASHINGTON — Liberalization of the Reconstruction Finance Corporation Act will help business to a limited extent as yet unpredictable. The "loans-to-industry" amendment says that the Corporation can "purchase the securities of and make loans to business enterprises whenever capital or credit at prevailing rates for the character of loan required is not available." Just what this means will not be clear until the regulations are set up and until Chairman Jesse Jones' intentions are known. He is an experienced banker and business man. His record in RFC indicates he will not let down the bars. He might get instructions to do so. But even so, not enough industrial loans will be made to make a stir in the nation's business, unless something else starts recovery first. In that case the loans might become an epoch in current history.

About 90 per cent of RFC's industrial loans have been for not more than $100,000. Obviously the money went to little business. Furthermore, the total of industrial loans is unimpressive: about $100,000,000. That record is not necessarily a criterion, however. The loans were made under a five-year limit. And RFC's life-time includes several years of deep depression. Probably the five-year term will be extended to 10, 15 or 20 years. If business turns up again soon, that too would encourage loan ventures. Long-term loans undoubtedly would save many a deserving company from bankruptcy if a prolonged depression develops.

There will be an avalanche of applications from companies near and below the commercial credit margin. If the regulations follow the spirit of the amendment, it would appear that some of them *could* be granted. Apparently the intent of Congress was to authorize RFC to go as far as "character" loans. But will Mr. Jones do that? Obviously, if marginal concerns can get loans they will be helped as long as the money lasts. Whether the government eventually loses the loan can make little immediate difference. Looking ahead over a long period, loans of any kind can permanently help only capable management. As every banker knows, millions will grab at loans but only a few can use them profitably.

Washington representatives of business see the loan liberalization as an expedient rather than as a basic move in the solution of industry's problem. Some phases of it, in fact, will be bad. It will carry still further the Administration's philosophy of "helping" everybody who fails, at the expense of those who struggle through. And eventually it will put the government in direct competition with those who win.

The Maritime Commission is making some progress toward new ship construction, against heavy currents that at times seem likely to prevent achievement of a merchant marine worthy of the name. Builders who bid unacceptably high on eight standard cargo ships came down to terms with the Commission's estimates, after the designs had been modified in detail. But Commission lawyers said negotiated contracts are not legal, so new proposals will be invited. Meanwhile, four more ships were added to the eight, which makes 16, counting four that will be awarded to a small Tampa firm when it gets an RFC loan for equipment and wages. Bids will be asked also on four boats for American Export, under a subsidy agreement. One liner is being laid down for United States Lines. Twelve tankers are "in the works" by Standard Oil, with national defense features. Total building: 33 ships. Cost: $101,000,000.

Chances of government attack on the steel basing point system are slight just now. The Administration is not sure an attack on legality of the system would stick. Mr. Roosevelt and his anti-monopolists do not like the basing point system; it looks like collusion to them. But they will wait for a better opportunity and a better plan of attack.

Opposition to the compulsory licensing bill was much stronger than its sponsors expected. Rep. W. D. McFarlane was forced to amend his proposal so drastically that it would apply only to locked-up patents, to those articles insufficiently supplied to the nation, or to those involved in unfair trade practices. Action is unlikely this session.

Congress is not much impressed by pacifist protest against export of scrap. The fighting-cock countries would get iron somewhere else at a little higher cost. Nor is it sympathetic with American industry which must pay higher scrap prices because of export demand. Washington opinion is that export is making jobs and that domestic ferrous metal supply seems inexhaustible. Scrap export licensing law is improbable.

Any more progress on wages-hours this session would be a fluke. AFL will have none of it. CIO appears favorable but is talking through its hat. The House Rules Committee vote that bottled the bill today stands the same to a man. The President has abandoned it to clear the deck for pump-priming. Next Congress will try it again.

CARRIERS TO BUY EQUIPMENT

There are going to be a lot of orders for cars, machinery and equipment of all kinds from railroads. Jesse Jones already has negotiated two R.F.C. loans to carriers totaling nearly $30,000,000, ALL of the money to be spent for equipment. The terms are four per cent, no payment on principal for two years and then amortization to conclude the loan in 15 years after issuance. The president of one of the railroads involved, which has not bought any new equipment since 1929 and which has been renting badly-needed cars, says privately that he expects many railroads to take advantage of such loans. Negotiations are now under way between R.F.C. officials and several other carriers for loans which should result shortly in car, machinery and equipment orders.

DETROIT LETTER

Car production off almost 50 per cent from last year . . . Second quarter output to be less than 900,000 units . . . Uncertainty about fall business holds up tooling programs . . . Small cars may not be introduced in '39 . . . Hudson and U.A.W. disagree

DETROIT—For a moment at the tail-end of March it appeared that the automobile industry was finally picking up speed. After having staggered through the first 20 days of March at the worst sales rate for that period since 1933, sales jumped in the last 10 days, increases ranging from 10 to 100 per cent. But when the count was in, March showed only a 16 per cent gain over February in production, as against a normal seasonal upturn of 35 per cent. March was off 55 per cent from last year, compared with 46 per cent in February and 44 per cent in January.

The first quarter wound up with a net decline from 1937 of 49 per cent. Perhaps it is a little unfair to make comparisons with last year, which was the industry's second biggest year. Nevertheless output during January, February and March was off 12 per cent from 1934 and that was the last year when less than three million cars were built.

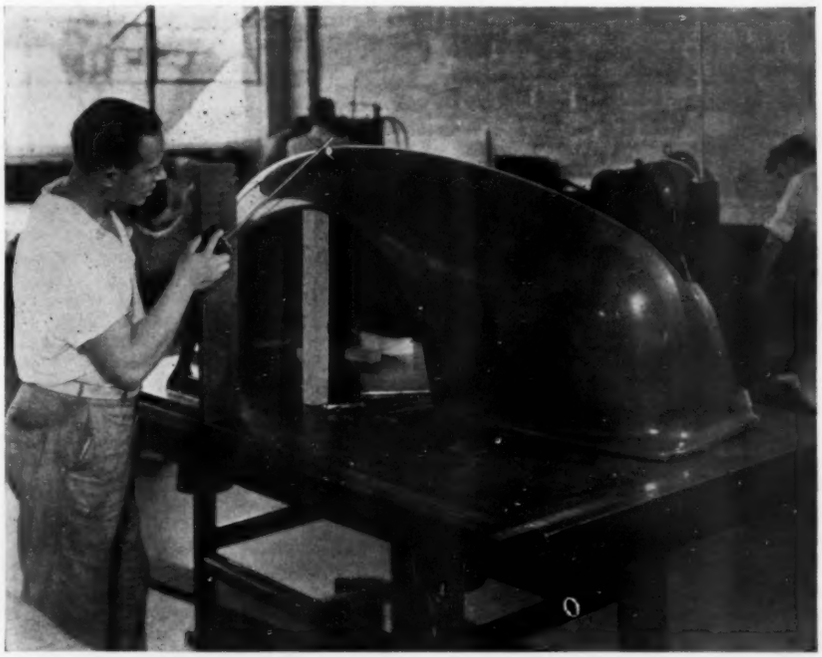
It is doubtful, from sales reports already available, whether production in April will be raised higher than 275,000 units, a decline of better than 50 per cent from last year. A guess of the industry's output for the second quarter would be around 900,000 units as a maximum. The third quarter should find a number of companies shut down for one or two months for model changes and to clean up dealer stocks.

Only a miracle will push the year's production beyond the three million mark. Just what the total for 1938 will be depends pretty much on the final quarter's record and today nobody would hazard a guess regarding sales or production that far ahead. As a matter of fact, it is that uncertainty about the fourth quarter which is holding up so much activity in Detroit right now.

Most of the industry's thinking is about next fall. However, lacking adequate means of judging next year's potential business, car makers are delaying many programs designed for 1939. Many tooling plans have been worked out in complete detail, ready for release and approved by engineering and production departments, but have been held up week after week. The industry doesn't know whether to gamble with major redesigns or not. At least that is true of several manufacturers. What these companies are doing is to release whatever tooling orders cannot be avoided—for changes which will be made no matter what happens—and to postpone further action.

Even six weeks ago trade observers would have bet anything from a hat to a parachute that next year would see a number of lighter low-priced cars added to existing lines. Today they aren't so sure. Reports are that at least one manufacturer had definitely dropped plans for its smaller car, though it had gone farther than others in arranging for tooling and new equipment. Since the industry usually "follows the leader," others may abandon their plans too. On the other hand, the small cars are designed and need only purchases of machinery to have them rolling off production lines, so that car makers still can make a quick about-face. It is a foregone conclusion, moreover, that if one of the Big Three brings out a small car, the other two will do the same. The reason for hesitancy is that today the market for even the lowest-priced models is weak. In the so-called low-priced group, the more expensive models have continued to make the best showing. Even if manufacturers should decide to go ahead with the little cars, they could not get them ready by show time.

So far as current production is concerned, car companies seem willing to go along taking what comes their way. Sales campaigns are being carried out, but not with the wholeheartedness apparent in recent years. No maker is pushing dealers. Used car stocks have been reduced to some extent since last fall, but manufacturers want to see them cut more to put dealers in a healthier position. Nobody wants new car deliveries to get ahead of used car sales.



Rivaling in interest the question of whether or not sales will take a jump this Spring is the problem of 1939 models. Dies are beginning to come through and are undergoing careful scrutiny

Of major interest to the industry is the Fair Trade Practice Conference to be held April 23 to 25 in Detroit concurrently with the automobile dealers' convention. The dealer association has already obtained a set of fair trade practice rules and is reported to have the tentative approval of the Federal Trade Commission. Most important rule, insisted upon by the F.T.C., deals with the fixing of old car allowances. Standardization of used car allowance is interpreted as price fixing. Dealers didn't want the rule but got it anyway. Yet without some control of used car trading allowances the heart of the present dealer problem remains untouched.

On the labor front, Hudson has joined Ford in operating without a U.A.W. contract. Hudson's contract expired while negotiators were still deadlocked. The U.A.W. was willing to accept renewal of the former contract, but Hudson wanted modifications. The union thereupon announced it would continue to operate" under the Wagner Act" and requested the NLRB to certify it as exclusive bargaining agent. No request was made for an election.

Junking Plans

Junking plans still continue a major topic of conversation. The dealer convention will project such a junking plan, but chances are against anything coming of it. The trouble is that any junking plan would involve a subsidy which would have to come out of new car sales, resulting in an increase in car prices.

Ford has been doing some small-scale junking, within a radius of 300 miles of Detroit, but the price ($12.50 per car) has not created much dealer enthusiasm.

Detroit Notes

One of the "Big Three" is to announce a line of cab-over-engine trucks the first of the month. . . . Emerson Frantz has been named general sales manager of Bohn Aluminum and Brass Corp. He has been with the company in the bearing division for a number of years. . . . Detroit's street car strike brought a flood of letters to the mayor's office commenting on the noticeable absence of street-car noise downtown. The mayor broke the strike by threatening to get enough buses to handle all traffic and forget about street cars entirely. . . . Briggs had a 24-hour strike last week—a slow-down—causing the company to shut down and forcing Plymouth to follow suit due to lack of bodies. . . . Peerless Molded Plastics, Inc., has been formed in Toledo with William G. Skutch and Purcel De Han of Owens-Illinois Glass Co. in charge. O-I isn't going to be caught napping if there is a swing from glass to transparent plastics. . . . Cadillac has installed an air-conditioning system in its foundry. . . . Not satisfied with Sears Roebuck orders, Graham-Paige is now offering Graham Bradley tractors to its dealers to sell. . . . Detroit's most violent strike-of-the-year, at Federal Screw Works, was finally settled with a new contract guaranteeing against wage reductions for 90 days, and including a 60-day cancellation clause.

Index of Machine Tool Orders

Based on Volume of Shipments for 1926

Month	Index of Orders: Domestic	Foreign	Total	3 Months' Average Index	% Foreign to Total Orders
1937 — March	172.1	39.5	211.6	192.4	19
April	232.5	50.0	282.5	219.8	17
May	161.4	47.1	208.5	234.2	23
June	137.6	54.2	191.8	227.6	28
July	115.4	55.7	171.1	190.5	33
August	129.5	50.3	179.8	180.9	28
September	119.0	91.7	210.7	187.2	44
October	89.1	62.9	152.0	180.8	41
November	63.3	64.4	127.7	163.5	50
December	53.5	89.2	142.7	140.8	63
1938 — January	43.2	75.2	118.4	129.6	63
February	48.7	27.0	75.7	112.3	35
March	50.5	56.5	107.0	100.4	52

Distribution of Orders

Average Index of Individual Companies Based on 1926 Level of Business	Companies in Per Cent of Total Number Reporting: 1936 2nd Quar.	1936 3rd Quar.	1936 4th Quar.	1937 1st Quar.	1937 2nd Quar.	1937 3rd Quar.	1937 4th Quar.	1938 1st Quar.
200–up	17.2	15.8	28.4	31.6	38.5	33.4	23.0	13.5
100–199	32.6	28.8	30.2	32.8	29.1	30.2	23.2	18.3
60– 99	19.0	22.9	19.5	16.4	15.1	15.7	18.6	19.3
20– 59	21.8	21.7	15.2	12.2	11.4	12.7	22.0	30.3
Less than 20%	9.7	10.8	6.7	7.0	5.9	8.0	13.2	18.6

German Prices Hurt Our South American Trade

NEW YORK—Increasingly strong competition from Germany is making it tough for exporters here to sell equipment and machinery in South American markets. There are several reasons for this situation.

1. Germany has trade agreements with practically all countries in Central and South America whereby they exchange raw materials for manufactured goods. Payment is made in German ASKI marks (which, by the special value assigned to them by Germany, is in effect a subsidy).

2. The German trade has been well organized in the past, and hundreds or even thousands of satisfactory installations of equipment have been made. These are used as levers to get new orders.

3. At present Germany is strongly represented by agents, distributors, and branch offices. Large stocks of motors, pumps, engines, machine tools, and other equipment are maintained so that the South American buyer can make his own selection and take immediate delivery.

4. Prices of German equipment are generally much lower than American equipment.

Quality of American goods is not the basis for making sales in South America in the view of one traveler who has returned from an extended trip. It is exceedingly difficult to make a sale on the basis that competitive German equipment is at present inferior, even though it comes from a reputable manufacturer. His past successes are held up as proof of his ability, and it is not until something goes wrong that the higher-priced American merchandise comes into the picture. Lack of raw materials and of skilled labor has hampered the German manufacturer recently, but the Reich government realizes the situation and is taking steps to correct it. When that is done the position of our South American trade may become more untenable, and it may be necessary to resort to subsidies as advocated by Mayor LaGuardia.

Perhaps Germany has over-reached herself by strenuous trade efforts in the South American countries. There are signs that they resent the large

favorable trade balances built up by Germany and unfavorable to themselves. Nicaragua, for example, no longer accepts the ASKI marks, and demands a 10 per cent deposit in American dollars on all imports and exports, the money to be deposited with the central planning board. Colombia likewise demands a 5 per cent deposit on imports. Substitution of American exchange has worked hardship on German agents and those who do business with them.

Mexico, since expropriation of foreign oil properties, has been the sore spot. The pegged rate of the peso, 3.60 to the dollar, has been dropped, and it is difficult to make committments in a currency that is jumping about. Most observers feel that Mexico will shortly go to a strict control of exchange. While those with uncollected accounts are likely to suffer, it is believed that the situation will be worked out satisfactorily in the end.

Current orders for machine tools from South America are disappointing. What business is being received is for high-grade American equipment.

Used machine tool sales for the foreign market are slower. Sources for such equipment want high prices. Many tools are going abroad, but it is questioned whether present sales are yielding much profit.

Refrigerating Machinery Association Meets in May

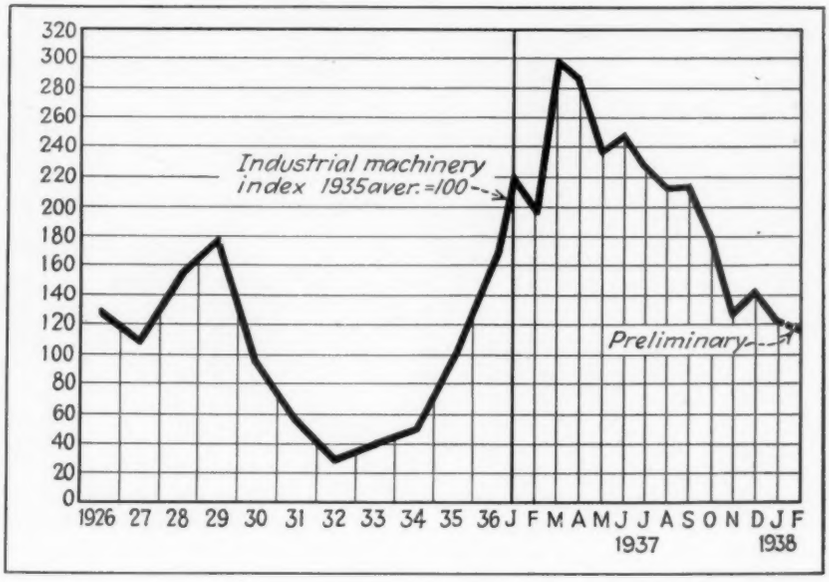
WASHINGTON—According to an announcement by J. M. Fernald, president of the Refrigeration Machinery Association, the spring meeting will be held on May 11-12 at Hot Springs, Va. Consideration will be given to the equipment standards developed by the Association's engineering staff during the past several months. Discussion will center around extension of the standardization program, which is of such broad scope as to have required planning for several years ahead.

Air Conditioning Meeting

WASHINGTON—The annual meeting of the Air Conditioning Manufacturer's Association will be held at Hot Springs, Va., on May 13-14, according to J. A. Harlan, president. Plans for extending the Association's work in the technical, research, educational and sales promotion fields will occupy a prominent place on the meeting program.

Industrial Machinery Index Off

February figures, practically complete, show that the American Machinist Index of Industrial Machinery Orders dropped again. At 118 it stands at about 60 per cent of the figure for February, 1937.



1938 Credit Congress to Convene in San Francisco

BAY CITY, MICH.—For the 43rd consecutive year, leading credit and financial men will meet to discuss matters which have a direct effect on the credit health of the nation. Meetings this year are to be held at the St. Francis Hotel, San Francisco during the week June 5-10.

For the past eight years, development of interest in specific industry groups has been expanding considerably. H. E. Kay, credit manager, Industrial Brownhoist Corp., is again serving as national chairman of the machinery manufacturers group. A comprehensive program has been prepared listing topics for discussion which have a vital bearing on the future possibilities of the machinery industry. The underlying purpose of these discussions is to arrive at definite conclusions as to how the industry may be maintained on a sound basis from the credit standpoint. All manufacturers and suppliers of machinery are invited to attend whether or not they are members of the National Association of Credit Men.

Economics Conference Scheduled for June

HOBOKEN, N. J.—The eighth annual economics conference will be held at the Stevens Engineering Camp, Johnsonburg, N. J., from June 24 to July 2 under joint sponsorship of the Stevens Institute of Technology and the Society for the Advancement of Management. The conference group will be divided into six sections—four sessions daily through the week on motion and time study, human relations, marketing, industrial management and management problems. One section will serve as a round table for teachers of management.

Third Forum on Machine Tool Electrification

EAST PITTSBURGH—For the purpose of discussing more accurate and finer control to meet the increasing needs of industry, the 1938 Machine Tool Electrification Forum will be held at the Westinghouse Electric & Mfg. Co. from May 9-11. The program will include papers on special and difficult problems presented by representatives of machine tool builders. Talks will also be given by Westinghouse application and design engineers. Last year 72 delegates representing 50 machine tool builders were present.

1938 Foundry Show Will Be Held at Cleveland

CLEVELAND—Contracts signed for exhibit space in the Cleveland Auditorium indicate that this year's Foundry Show will be one of the largest staged by the American Foundrymen's Association. The Show will open on Saturday, May 14, at 1:00 p. m., and the convention will get under way on Monday and run through Thursday. Technical sessions will cover such subjects as gray iron, non-ferrous founding, malleable iron, steel castings, permanent mold castings. There will be a number of courses such as cast-iron shop practice, sand-shop practice, and malleable-shop practice.

Lincoln Establishes Australian Plant

CLEVELAND—J. F. Lincoln, president of the Lincoln Electric Co., has announced establishment of a manufacturing subsidiary to be called the Lincoln Electric Co. (Australia) Pty., Ltd., at Sydney. A factory has already been purchased and manufacturing operations on arc-welding equipment will begin in a year's time. Mr. Lincoln, who is expected back in the United States in May, visited all of the capital cities in Australia, giving a series of addresses before various engineering societies on the art of welding.

PERSONALS

In a revised schedule of responsibilities announced by GEORGE H. BUCHER, president of the Westinghouse Electric & Mfg. Co., the following assignments have been made:

Vice-president RALPH KELLY is placed in charge of sales with headquarters in the Pittsburgh executive offices. He was formerly in charge of Pittsburgh district works, including the headquarters plant at East Pittsburgh.

Vice-president R. B. MILDON assumes management of the East Pittsburgh division, going there from Philadelphia where he had charge of the steam and stoker departments.

Vice-president N. G. SYMONDS, long associated with sales operations, will devote his time in the sales department to specific customer activities, association work and special duties.

ROY A. MCCARTY, formerly manager of the small motor division at Lima, Ohio, is transferred to South Philadelphia as manager of the steam and stoker division. B. H. LYTLE, formerly a division manager at East Pittsburgh, goes to Lima as manager.

GEORGE A. BEE

GEORGE A. BEE, new president and general manager of the Palmer-Bee Co., Detroit, as announced previously (*AM*—Vol. 82, page 290k) has been with the company ever since leaving school and has worked in every department to familiarize himself with the operations involved. For about twelve years he was treasurer of the concern, and for the past six, treasurer and general manager.

E. P. BLANCHARD, sales manager of the Bullard Co., and Mrs. Blanchard sailed Thursday on the *Europa* for a three-months business trip abroad.

HUGH E. BROWN, director of research, W. S. Tyler Co., has been elected chairman of the Cleveland Chapter, American Society for Metals. H. D. CHURCHILL, Case School of Applied Science, is vice-chairman.

BURNS DREESE, manager of the scales division, Hobart Mfg. Co., Dayton, Ohio, has been made assistant general manager.

LESLIE W. CLAXTON, works manager of the Sheffield Twist Drill & Steel Co., Ltd., Sheffield, England, is now visiting the United States.

F. EBERSTADT and NICOLS MILBANK, JR., have been elected to succeed FRED B. LEWIS and LUTHER J. LEE, resigned, as directors of the Square D Co., Milwaukee.

ROLLO E. FALK, vice-president and general manufacturing manager, Revere Copper & Brass, Inc., was elected a director at the annual meeting.

BEN F. GEYER was re-elected president of the Wayne Pumps Co., Fort Wayne, Ind. at the annual meeting. W. F. BRANDT, was re-elected vice-president and production manager.

LYLE C. HARVEY, formerly vice-president of the Bryant Heater Co., Cleveland, Ohio, was elected president to succeed HENRY N. MALLON who is now chairman of the executive committee.

DONALD P. HESS has been elected president and a director of United American Bosch Corp., manufacturers of magnetos and other automotive equipment. He was formerly with Timken Roller Bearing Co., and more recently with Ebco Mfg. Co., Columbus, Ohio.

MAX W. BABB, president, Allis-Chalmers Mfg. Co., has been elected a director of the Cutler-Hammer, Inc.

NEWBOLD C. GOIN has been made sales manager of the Gearing Division, Westinghouse Electric & Mfg. Co., succeeding L. R. BOTSAI who has been made sales manager of the Fractional Motor Division at Lima, Ohio.

A. C. HOWARD, assistant general manager of the Fairbanks, Morse & Co., Beloit Works, has been made general manager of the plant, and he is succeeded as assistant general manager by CHARLES H. MORSE, III.

H. W. JONES, vice-president of the Bridgeport (Conn.) Brass Co., has been elected a member of the board of directors. Other officials and directors were re-elected.

STEWART F. MALCOLM has become associated with Borg-Warner International Corp., Chicago, in charge of electrical appliance, refrigeration and air-conditioning parts department. Previously Mr. Malcolm was connected with Melchior-Armstrong-Dessau Co., New York, handling the exporting of refrigeration and air-conditioning supplies.

HAROLD J. SKIDMORE, formerly assistant superintendent, has been appointed factory manager and superintendent of the Detroit plant of the Morse Chain Co. Mr. Skidmore has been with Morse Chain at Detroit for over fifteen years, and was formerly with the Northway Motor Co.

HUGO STOKVIS, managing director of R. S. Stokvis & Zonen, is in the United States on a business visit.

H. S. STROUSE has been appointed vice-president of the Harnischfeger Corp., Milwaukee, manufacturer of traveling overhead cranes and excavators. Along with the duties of his new position, Mr. Strouse will continue to direct the activities of the treasurer's department.

JAMES S. WATSON, vice-president and general manager of the Indianapolis plants of the Link-Belt Co., has been elected president of the Indiana Manufacturers' Association.

OBITUARIES

JOHN S. ALCORN, president of the Alcorn Machine Works, Waltham, Mass., died April 5, at the age of 78.

GILBERT D. BOYD, 52, vice-president of the Wallingford (Conn.) Steel Co., a subsidiary of the R. Wallace & Sons Mfg. Co., died March 30.

JOSEPH WOODLEY GOSLING, 59, decorative designer for the General Electric Company's illuminating engineering laboratory since 1912, and responsible for the spectacular illumination of practically every world's fair since the Panama-Pacific exposition, died April 4 in Schenectady.

FRANK G. TALLMAN, 78, a vice-president of the E. I. du Pont de Nemours & Co., Wilmington, died April 1. Before joining du Pont in 1905 as director of purchases, he was purchasing agent for the Brown Hoist Co., Cleveland.

FREDERICK THOMAS MOORE, first vice-president and general works manager of the Colt's Patent Fire Arms Manufacturing Co., Hartford, died March 31 at the age of 62. Mr. Moore was an expert in the manufacture of machine guns and was for some years associated with JOHN M. BROWNING in developing automatic pistols as well as machine guns. He became general works manager of Colt's in 1918 and vice-president in 1929.

JAMES M. CLEM, 72, vice-president and a director of the Ohio Forge & Machine Corp., died recently. He founded the company in 1903.

JOSEPH PEYSER, inventor and manufacturer of machinery used in the canning industry, died in Mount Vernon, N. Y., at the age of 51. He was president of the Peyser-Hansen Machine Co.

H. T. STOTT, vice-president and general manager, Continental Cushion Spring Co., Chicago, died April 2 at the age of 53.

LAWRENCE K. SLABACK, 56, manager of sales in the Cincinnati District for the Carnegie-Illinois Steel Corp., and also for the Tennessee Coal, Iron & Railroad Co., died on March 29.

WILLIAM WERNER TRIMPI, president of the Newark Rivet Works, Newark, N. J., died recently at the age of 78.

BUSINESS ITEMS

The A. F. Holden Co., New Haven, Conn., metallurgical engineers and makers of heat-treating baths, has appointed the James H. Knapp Co., 4920 Loma Vista Ave., Los Angeles, as California representative.

The Bradley Machinery Co. of Wisconsin has changed its name to the State Machine Tool Co. The location is the same as formerly—730 W. Virginia St., Milwaukee, Wis. Personnel and facilities remain the same.

The Steel & Tube Division, The Timken Roller Bearing Co., has appointed Joseph T. Ryerson & Son, Inc., to warehouse Timken mechanical tubing (S.A.E. 1015 steel) in territories served by Boston, Jersey City, Buffalo, Cincinnati, Chicago, St. Louis, Cleveland, Detroit and Milwaukee.

BEN W. DIMEND has become associated with the Jackson-Fotsch Co., Chicago, representatives for Kearney & Trecker milling machines, John Bath & Co., Eclipse Counterbore Co., Detroit Broach Co., and the Dalrae Tools Co. Mr. Dimend was recently with the Federal Machinery Sales Co., Chicago, and before that was a direct factory representative for the Warner Swasey Co. in California. He will travel in Northern Illinois and will call on the trade on the north side of Chicago.

The St. Louis office of the Allen-Bradley Co., manufacturers of motor control equipment, has been moved to 404 N. 17th St. G. W. SCHALCHLIN is district manager.

Gisholt Machine Co., Madison, Wis., has announced the following territorial and personnel changes in its direct sales representation: The company's Eastern Office at 1060 Broad St., Newark, N. J., in charge of R. D. HEFLIN and R. H. BRUCE, will handle Eastern New York, Eastern Pennsylvania, the entire States of New Jersey, Delaware and Maryland. Western New York, including the Syracuse, Rochester and Buffalo areas will be in charge of GLENN M. ROGERS, 7 Maple St., Pittsford, N. Y. D. A. WALTERS, formerly of the Ohio territory, has been transferred to the Detroit office, No. 4-270 General Motors Bldg., where he is associated with U. S. James. The State of Indiana south of and including Muncie will be covered by the Dayton office, 1506 Mutual Home Bldg., in charge of E. B. VERNER. HAROLD EARL, formerly of the Gisholt service staff, has been transferred to the Chicago area sales office, 2400 W. Madison St., under C. J. BAXTER, and will cover Western Illinois, the State of Iowa and the St. Louis district.

Following confirmation of a plan of reorganization in 77-B proceedings, the Automatic Machinery Manufacturing Corp. has been organized to carry out the provisions of the plan and succeeds to the business and assets of the Automatic Machine Co., Bridgeport. The plan was developed by GEORGE L. SEXTON, president of the old company, in cooperation with the Aetna Industrial Corp., New York. Mr. Sexton will remain as president and general manager of the new organization. It was announced also that the active personnel of the Automatic Machine Co. will continue.

Difficulty between the Driver-Harris Co., Harrison, N. J. and the C.I.O. was settled on April 5 and the plant has reopened and resumed operations in all departments. Production of alloy castings and alloy wire is again on a normal basis, and immediate deliveries of wire are being made from stock.

The Stutz Motor Co. of America, Inc., is insolvent and no reorganization can be found which is acceptable to two-thirds of the creditors, according to a finding by a special master in chancery in the Federal court, Indianapolis. The company has been operating under Section 77-B and has been manufacturing Pack-Age cars and pickup delivery trucks.

The Eberhard Mfg. Co., Cleveland, Ohio, a division of the Eastern Malleable Iron Co., will soon complete an extensive plant improvement program, according to A. L. WHEELER, managing director. New machinery is being installed in the Eberhard machine shops and the program also includes installation of equipment for a continuous production line in the foundry.

Industrial Machinery Co., dealers in used machinery, 220–230 Fletcher Ave., Indianapolis, has been reorganized as Industrial Machinery Co., Inc., with E. B. KNICKERBOCKER as president; JAMES E. HODGES, vice-president; LEONARD SMITH, secretary-treasurer.

The Laporte Machine & Tool Co., Laporte, Ind., has filed papers with the Indiana secretary of state evidencing the dissolution of the corporation.

The Lynch Corp., Anderson, Ind., manufacturer of glass-blowing machinery and allied products, has purchased the plant of the Modern Equipment Co., at Defiance, Ohio, which also produces equipment for glass factories. The Defiance plant will be operated as a separate industry, according to T. C. WERBE, president of the Lynch Corp.

Since changing its name from the Welch Tool & Mfg. Co. to Atlas Tool Co., unforeseen conditions have arisen, and the name has been changed to Atlas Engineering Co. Address is 11725 Strathmoor Ave., Detroit. The company makes milling cutters, form cutters and special tools.

Black & Decker Mfg. Co. has opened a factory service branch at 935 N. Illinois St., Indianapolis, where a complete stock of replacement parts will be carried.

Sullivan Machinery Co., makers of air and gas compressors, rock drills, hoists and coal mining machinery, is moving its general offices from 307 North Michigan Ave., Chicago, to Michigan City, Ind. The Chicago sales office will remain at the Chicago address.

MEETINGS

AMERICAN ELECTRO PLATERS' SOCIETY. 1938 convention, June 13–17. Hotel Schroeder, Milwaukee. W. J. R. KENNEDY, executive secretary, 90 Maynard St., Springfield, Mass.

AMERICAN GEAR MANUFACTURERS ASSOCIATION. Twenty-second annual meeting, April 25–27. General Brock Hotel, Niagara Falls, Canada. J. C. MCQUISTON, manager-secretary, Penn-Lincoln Hotel, Wilkinsburg, Pa.

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS. Summer convention, June 20–24. Washington, D. C. H. H. HENLINE, national secretary, 33 West 39th St., New York, N. Y.

ASSOCIATION OF IRON & STEEL ENGINEERS. Annual spring conference, April 28–29. Lord Baltimore Hotel, Baltimore, Md. Association headquarters, 1010 Empire Bldg., Pittsburgh.

NATIONAL ASSOCIATION OF PURCHASING AGENTS. Twenty-third annual international convention, May 23–26. Jefferson Hotel, St. Louis, Mo.

NATIONAL METAL TRADES ASSOCIATION. Fortieth annual convention, May 25–26. The Biltmore Hotel, New York, N. Y. HARRY S. FLYNN, secretary, Peoples Gas Bldg., Chicago, Ill.

SOCIETY OF AUTOMOTIVE ENGINEERS. Summer meeting, June 12–17. The Greenbrier Hotel, White Sulphur Springs, W. Va. JOHN A. C. WARNER, secretary and general manager, 29 West 39th St., New York, N. Y.

WELDING CONFERENCE. Tri-state conference (Western Pennsylvania, Eastern Ohio, West Virginia) sponsored by the Engineers Society of Western Pennsylvania and the Pittsburgh Section, American Welding Society, April 29. William Penn Hotel, Pittsburgh.

SHOP EQUIPMENT NEWS

Natco "Holeway" Special Multiple-Spindle Drilling, Tapping and Chamfering Machines

Special Natco "Holeway" combination drilling and tapping machines and a vertical cylinder chamfering machine have been shipped recently to the plant of a large automobile manufacturer by The National Automatic Tool Co., Richmond, Ind. These machines have been developed to perform a wide variety of operations with a single handling of the work. The unit shown in Fig. 1 is a horizontal machine assembled with eight "Holeunits", one tapping unit and a straight-line mechanical indexing-type fixture, which is arranged to hold two cylinder blocks in each position. Each "Holeunit" drilling unit has a fixed-center, gear-driven spindle box, the eight boxes containing a total of 84 anti-friction-bearing mounted spindles complete with nose adjustment and four tapping spindles complete with individual lead screws and tap holders. Tapping spindles are driven by the auxiliary reversing-motor-drive unit.

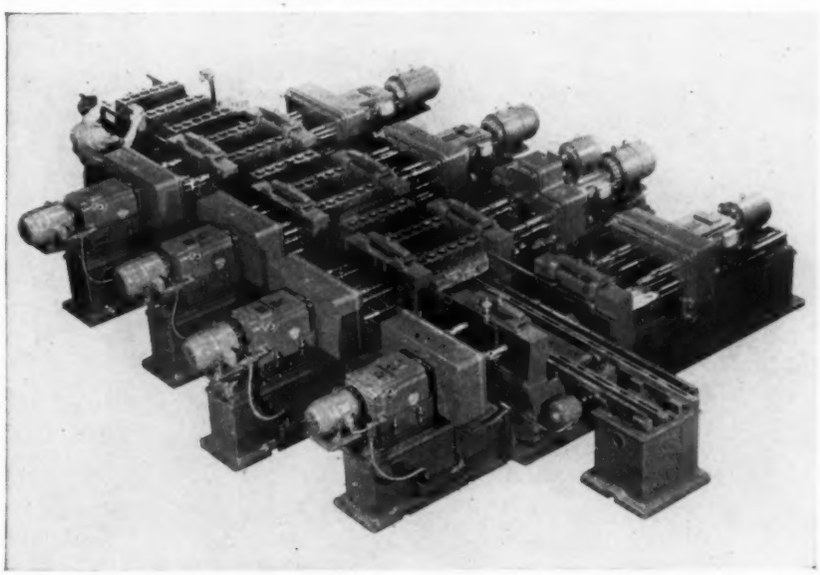
One operator loads the machine and has complete control of its operation through the use of a single pushbutton station which is conveniently located. The cylinder blocks come to the machine on a roller-type conveyor, being positioned by the operator at the loading station. Once positioned, the blocks then are indexed automatically from one station to another and are unloaded automatically at the sixth station. The entire machine is electrically interlocked and normally will perform the complete group of operations at a rate of approximately 90 blocks per hour. A total of 47 drilling, chamfering, counterboring, reaming and tapping operations are performed on the two ends of the motor block. Weight of this machine is 60,500 lb.

Two station-type combination drilling and tapping machines, similar to that shown in Fig. 2, perform a total of 154 drilling, countersinking, reaming, spotfacing and tapping operations each 40 sec. to maintain a production rate of 90 cylinder heads per hour. The machine shown has a steel column and base, four horizontal Natco "Holeunits", three vertical "Holeunits" and one vertical reversing-motor-drive individual lead screw tapping unit. The four horizontal drilling units have boxes containing a total of 19 spindles, complete with nose adjustment. The vertical units are arranged with a total of 42 spindles of similar construction. Tapping unit has eight tapping spindles complete with lead screws and tap holders. Cylinder heads are held in six identical stationary-type fixtures which are mounted around the six-position, 66-in. diameter, automatic mechanical-indexing rotating table. As the cylinder heads are indexed from one position to another, a total of 77 operations are performed. Weight of machine is 60,100 lb. The second machine of this type, weighing 62,100 lb., also has a steel column and base and is equipped with four horizontal "Holeunits", one horizontal tapping unit, two vertical "Holeunits" and one vertical tapping unit. The six drilling units have a total of 62 spindles, while the tapping units have thirteen spindles complete with lead screws and tap holders.

Built entirely of standard Natco machine elements and a hydraulically-operated rotating table, the machine shown in Fig. 3 drills, counterbores, chamfers and taps the six spark plug holes, spotfaces the six intake and exhaust holes, and drills and taps two small holes in the end of cast-iron automobile cylinder heads.

One operater unloads, loads and controls the operation of this machine, maintaining a production rate of 90 cylinder heads per hour. The vertical spindle box contains twelve drilling spindles and six tapping spindles. Tapping spindles are driven by an auxiliary reversing-motor-drive unit mounted on the

Fig. 1—Having four Natco "Holeunits" and one auxiliary tapping unit, this horizontal machine performs 47 operations on the two ends of a motor block at the rate of 90 blocks per hour. Two cylinder blocks are machined at a time in each position



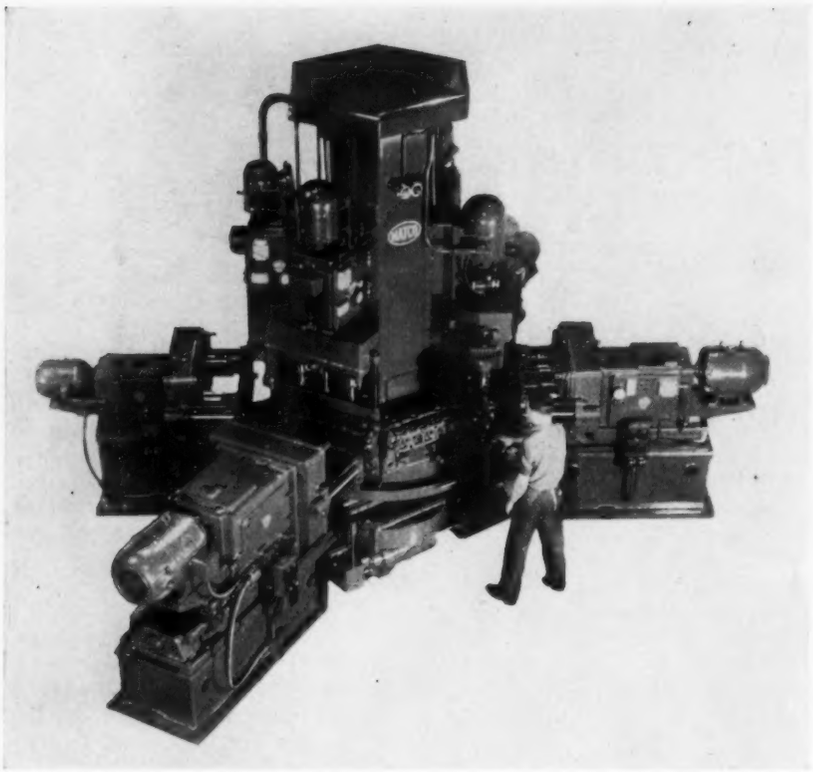


Fig. 2—Two Natco station-type combination drilling and tapping machines, each requiring one operator, perform a total of 154 operations on 90 cylinder heads per hour. Each machine has a six-position fixture mounted on an automatic, mechanical-indexing rotating table

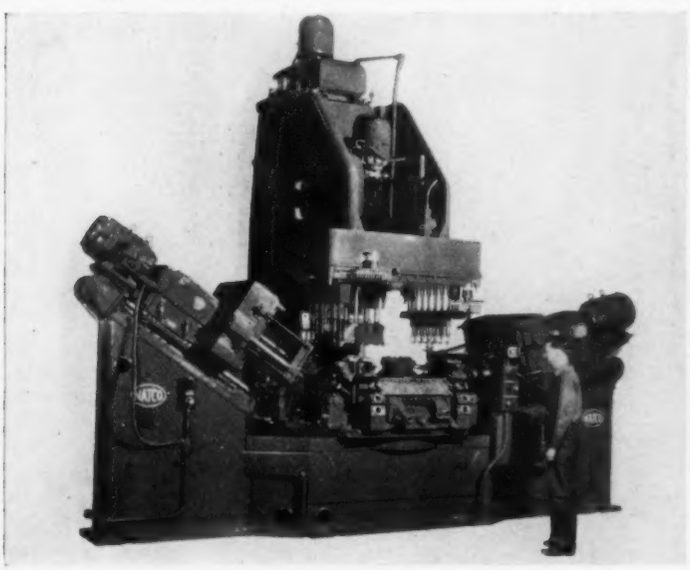
face of the box. The three "Holeunits" are arranged with spindle boxes containing a total of fourteen spindles of similar construction. A horizontal tapping unit is mounted on the back side of the right-hand "Holeunit" and is complete with a box containing two tapping spindles. Mounted on the steel pedestal is a 44-in. diameter, four-position, automatic, hydraulically-indexed rotating table in which, in turn, is mounted a four-position fixture arranged to hold one cylinder head in each position. Weight of the complete machine is 65,500 lb.

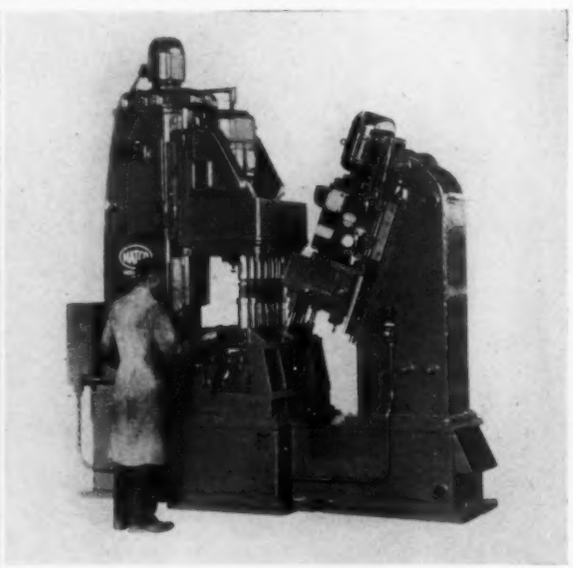
In addition to chamfering the top and bottom of the cylinder bores in an engine block, the machine shown in Fig. 4 performs four drilling operations on the distributor pad and boss. It is assembled from one vertical "Holesteel" machine and a "Holeunit" which is mounted at the proper angle. The vertical unit has a fixed-center gear-driven spindle box containing six heavy-duty, anti-friction bearing mounted spindles, complete with nose adjustment, while the "Holeunit" is fitted with a four-spindle box of similar construction. Mounted on the steel base is a stationary roller-conveyor type fixture which holds the cylinder block while the required operations are performed. One operator loads and unloads the fixture and operates the machine through the use of a pushbutton station. Chamfering tools are of a single-point design and are piloted in the cylinder bores. The top chamfering operation is performed by a revolving tool fed in a vertical plane while the bottom chamfering operation is done by a revolving tool fed both in a vertical and a horizontal plane.

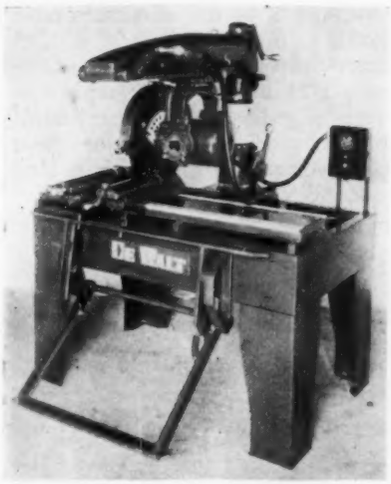
De Walt Type GE Metal Cutting Saw

De Walt Products Corp., Lancaster, Pa., offer the Type GE metal cutting machine for rapid sawing of light gage metals. It can be furnished with 5 or 7 ½ hp. motors operating at 3,600 r.p.m. for sawing steel or with a 5 hp. motor operating at 1,800 r.p.m. for sawing aluminum, copper, soft brasses and white metal alloys. It is claimed that when using

Fig. 3—A four-position fixture mounted on the automatic hydraulically-indexed rotating table of this Natco combination drilling and tapping machine carries automotive cylnder heads through a total of 40 operations performed from five directions. Fig. 4—This vertical, two-way Natco machine, left, chamfers the top and bottom of cylinder bores and performs four drilling operations on the distributor pad and boss of an automobile engine block







the correct saw tooth design and the proper peripheral speed, these materials can be cut rapidly and economically.

This machine consists of a structural steel table on which a semi-steel column, base and arm are mounted. An anti-friction mounted carriage, riding inside the arm supports the motor, to the shaft on which the saw is directly attached. Convenient food-operated vises clamp the material. Machine frame is adjustable, permitting the cutting of bevels without swinging the material. Over-all dimensions of the stardard short-arm machine are: height, 63 in.; depth, 43 in.; length, 48 in.; shipping weight, complete with vises, 950 lb.

Waterbury-Farrel Automatic Nut Tapper

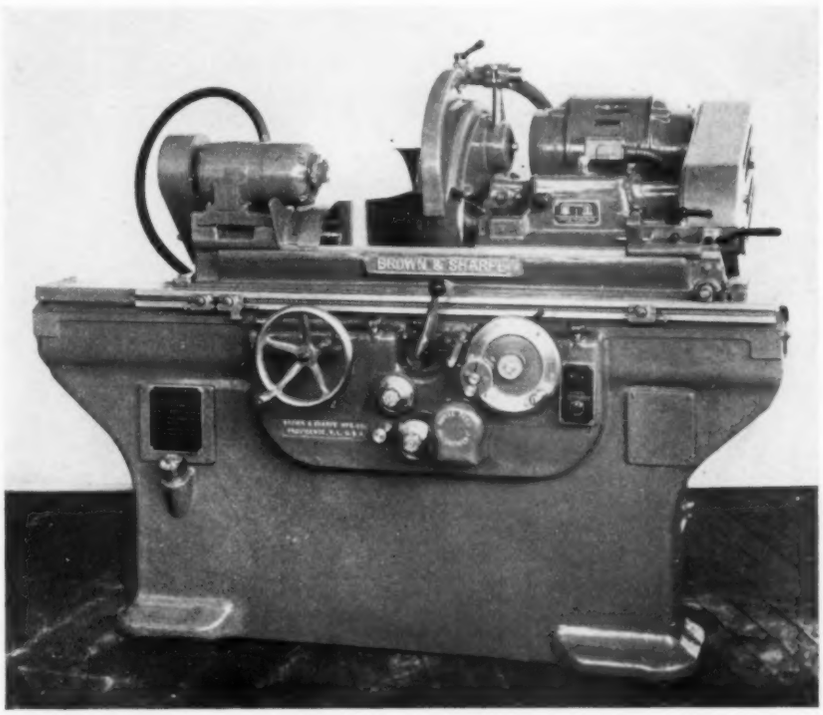
A stationary, straight-shank tap is used in the automatic nut tapper announced by The Waterbury Farrel Foundry & Machine Co., 425 Bank St., Waterbury, Conn. A mechanical device is employed to grip and revolve the nut blank over the stationary tap at the linear speed required by the lead of the tap threads. The machine shown is the intermediate or $\frac{1}{2}$ in. size and is recommended for nuts not over $\frac{7}{8}$ in. across flats and $\frac{1}{2}$ in. thick or the equivalent. Although this machine can be used for sizes down to and including $\frac{1}{4}$ in., it is not as efficient on smaller sizes. The $\frac{3}{8}$ in. capacity machine is recommended for these smaller sizes and the $\frac{3}{4}$ in. unit for larger sizes.

In operation, the nut blanks gravitate from a hopper down a chute which delivers them into line with and facing the tap, directly in back of a revolving head. They then are pushed automatically through this head and into a driving jaw within the head. Each nut thus is held square, relative to the tap, and is screwed onto it as the head revolves. Both nuts and tap are constantly freed of chips and are plainly visible while the operation is in process. Chips are washed away by the lubricant and collected in a removable drain box within the pedestal, separate from the nuts. Cutting oil is contained in a large tank in the pedestal of the machine. A 2 hp. motor is required to drive the $\frac{1}{2}$ in. capacity unit, which weighs approximately 2,750 lb. and requires 72x78 in. floor space.

Brown & Sharpe "Electric-Hydraulic" Nos. 10 and 12 Plain Grinders

Operated by a simple arrangement of hydraulic and electrical controls, conveniently grouped at the operating position, the No. 10 and No. 12 plain cylindrical grinders announced by Brown & Sharpe Mfg. Co., Providence, R. I., are designated for the rapid cylindrical grinding of small and medium-sized parts to close limits. They have hydraulic table drives and hydraulically-actuated cross feed. Wheel spindle, head stock, hydraulic pump and coolant pump have individual motor drives. The built-in electrical control system is claimed to simplify set-up for wheel truing and provides headstock "jog" to facilitate loading and unloading work. Coolant pump can be stopped to observe the work during grinding.

Handwheel control permits starting and stopping the headstock and coolant pump automatically when turning the cross feed handwheel to advance and withdraw the grinding wheel. Any rate of travel from 7 to 360 in. per min. can be selected for the hydraulic table drive which is claimed to reverse without shock at all speeds. Hand travel also is provided; the hand wheel being disengaged automatically when power travel is engaged. The cross feed ratchet and pawl mechanism is actuated from the hydraulic system, both on reversal of the table and continuously for plunge-cut grind-



ing. Amount of feed is governed by the setting of a crank of variable radius. A dial on the cross feed handwheel permits adjusting the automatic throwout to 0.0001 in.

Work size capacities are 6 x 18 in. for the No. 10 machine, and 6 x 30 in. for the No. 12, shown in the accompanying illustration. On both sizes, centers swing 6 $\frac{11}{16}$ in. over the table and a 24 in. wheel clears work to 4 in. diameter. The spindle takes straight sided wheels to 24 in. in diameter and 1 $\frac{1}{2}$ to 4 in. wide. A wheel spindle reciprocating arrangement, which gives a positive $\frac{1}{4}$ in. reciprocation of the grinding wheel for plunge-cut operation, is available. Another optional mechanism is the wheel slide rapid travel arrangement which provides a positive 2 in. advance and withdrawal of the wheel slide, controlled manually or semi-automatically.

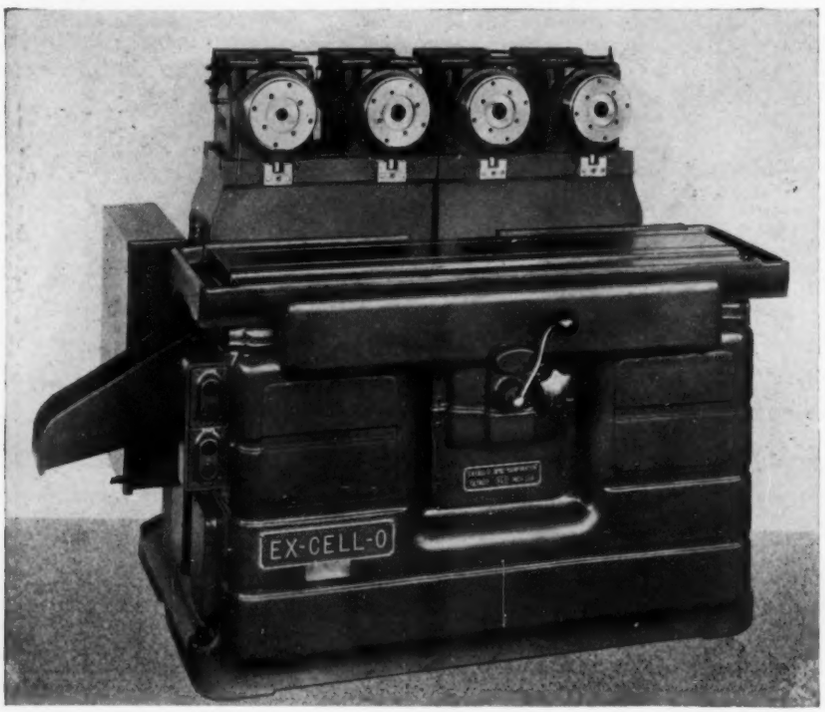
Ex-Cell-O "Precision" Facing Machine

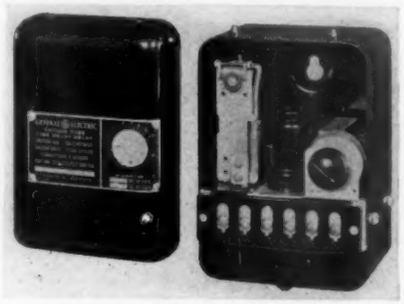
Precision facing, turning and grooving operations requiring accuracy and fine finish are said to be possible on the style 12 facing machine offered by Ex-Cell-O Corp., 1228 Oakman Blvd., Detroit, Mich. This machine is similar to "Precision" boring machines except that the spindle units are placed at right angles to the work table travel. The same hydraulic system for machine operation and control and the same ball-bearing spindles are used. Parts to be machined can be held in adapters or on an arbors and rotated; or they can be clamped in fixtures on the work table. Tools can be held in fixtures on the table or rotated by the spindles.

Spindles are mounted on bridges which are firmly attached to the machine face. Depending on the type required, any number of spindles from one to six can be accommodated on the bridges. Driving motors can be mounted above, beside or below the spindles, thus permitting a variety of combinations. A hydraulic cylinder operates and controls the work table traverse; location and length of table feed and rapid traverse are controlled automatically by adjustable dogs in a T-slot on the front of the table. Spindles are stopped at the completion of a cut by hydraulically operated brakes; these brakes being coordinated with the machine cycle by limit switches.

Between the table and bridges is a chip chute which may be arranged to direct chips to either side of the machine. Coolant reservoir is cast in the machine base and a coolant pump is driven by the main motor. A suction system can be installed for dry operations. Spindle units are aligned by micro-adjustable blocks at the front and rear of each spindle. For taper facing or turning, spindles are mounted at an angle on the bridge.

Specifications: over-all size of table 15$\frac{1}{2}$ x 50 in.; fixture pad on table, 15$\frac{1}{2}$ x 44 in.; maximum table travel, 12 in.; distance from floor to center line of spindles, 40 in.; table feed, 1-23 in. per min.; rapid traverse of table, 12 ft. per min.; spindle speed, set to suit job; floor space required for machine with chip tank, 56 x 73 in.





G. E. General-Purpose Vacuum-Tube Timer

A general-purpose vacuum-tube timer, designed particularly for machine tool application, has been announced by General Electric Co., Schenectady, N. Y. The electronic portion of this device consists of a G.E.-605 three-element, high-vacuum metal tube which is claimed to give long life to the timer and, in addition, can be inexpensively replaced through any radio supply store when continuous operating conditions make such replacement necessary.

The timer is arranged to operate on either 115 or 230 volts and 50 or 60 cycles. Contact tips are rated at 1 amp. at 115 volts and 0.5 amp. at 230 volts. It is calibrated with a scale having 10 divisions proportional to time. Maximum and minimum operating times on 115 volts are approximately 60 and 3 sec.

Eisler No. 600-CFO Improved Spot Welder

Welding mechanism, except for the driving arrangement, of the No. 600-CFO improved spot welder manufactured by the Eisler Engineering Co., 745 S. 13th St., Newark, N. J., is completely inclosed in a fabricated box-type frame. Capacity of the unit shown is 75 kva.; this type of welder being manufactured in 35 to 500 kva. sizes. Throat depth is 36 in.; however, any depth between 12 and 48 in. can be provided. Lower electrode is adjustable horizontally and vertically.

The $\frac{3}{4}$ hp. Reeves variable-speed drive and safety clutch included in the design of this machine permit a range of from 20 to 150 strokes

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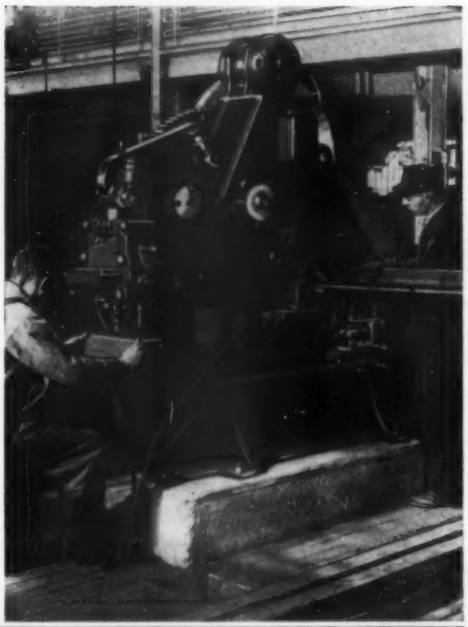

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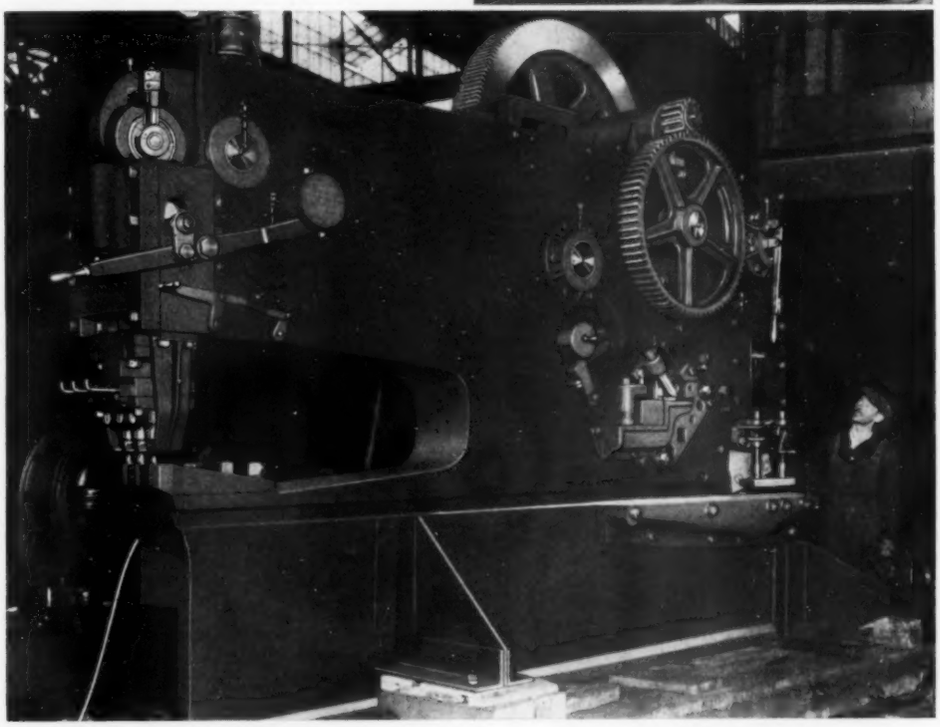

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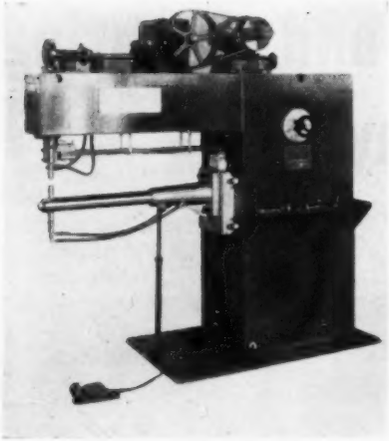
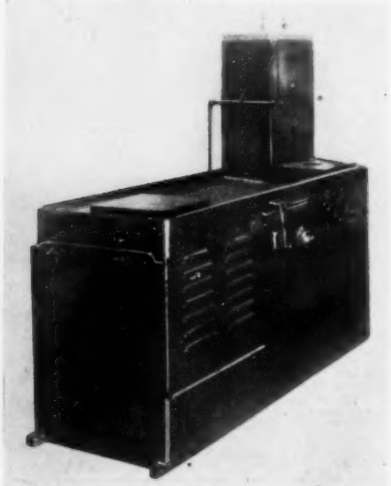


of the upper electrode per minute. Over-head driving cam gives the following upper electrode a stroke of 1½ in. Mounted on the same cam shaft is an additional cam which acts as a timer in regulating current dwell. An automatic timer with the contactor for more sensitive control and a single-phase welding transformer for 25, 40, 50 or 60 cycle service are supplied.

Colonial "Pull-Down" Broaching Machine

Broach puller of the improved "Pull-Down" broaching machine offered by Colonial Broach Co., Detroit, Mich., is of a self-cleaning design. Machine has a 5-ton capacity with an 18-in. stroke. It is operated hydraulically and is provided with variable speed control adjusted through the radial dial on the front of the machine. Maximum broaching speed is 30 ft. per min. with a high-speed return of 60 ft. per min. Hydraulic mechanism is inclosed within the base, where it is accessible by removing the sheet metal side cover plate. Machine can be arranged for automatic broaching, eliminating handling of the broach, if desired.

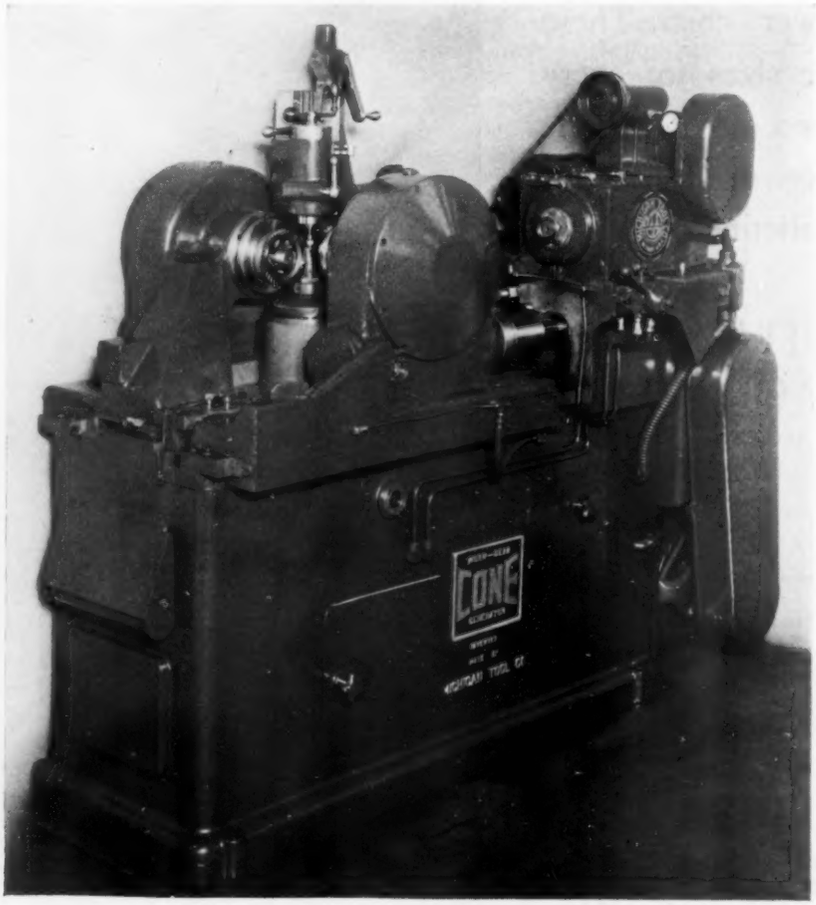


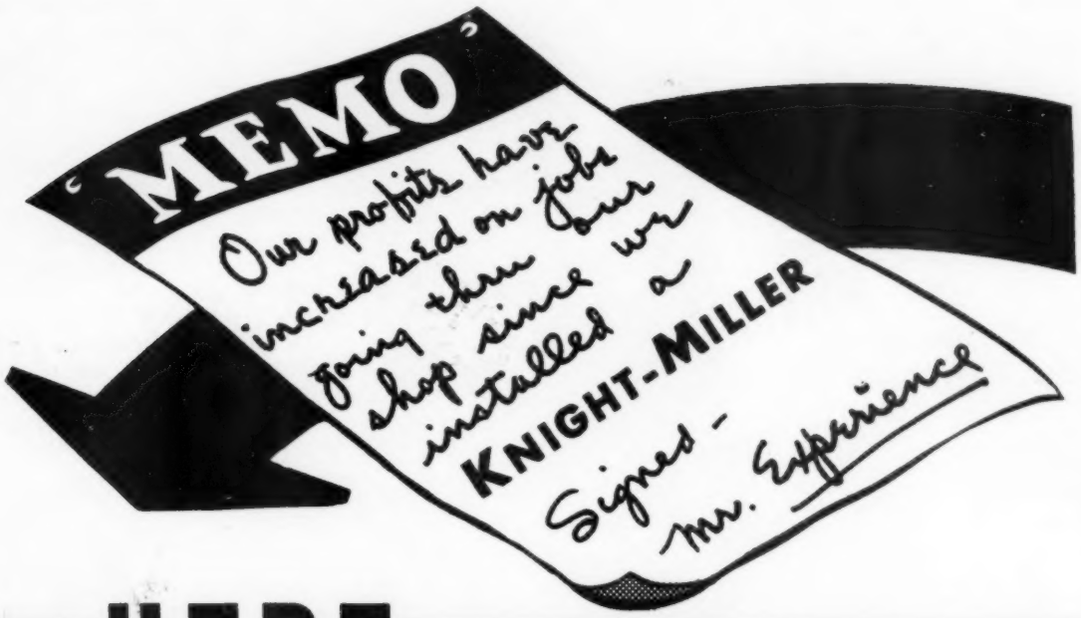
Michigan Automatic Cone-Type Worm Gear Generator

Designed with the work spindle permanently located in the bed of the machine, a line of automatic cone-type worm gear generators introduced by Michigan Tool Co., 7171 E. McNichols Road, Detroit, Mich., permit mass production of such gearing. Ordinarily, one machine is set up for the first or roughing operation in which a narrow-blade generating cutter is fed into the blank until the required center distance relation is reached. In the finishing part of the operation, usually done on a second machine, there is a differential rotary feed in which the cutter blades shave material off the faces of the worm and wheel teeth until the teeth are finish sized. These machines have capacity to cut gearing up to 4-in. center distance with wheels up to 7 in. diameter and worms up to 3 in. These sizes are said to cover virtually the entire range of gears produced in large quantities.

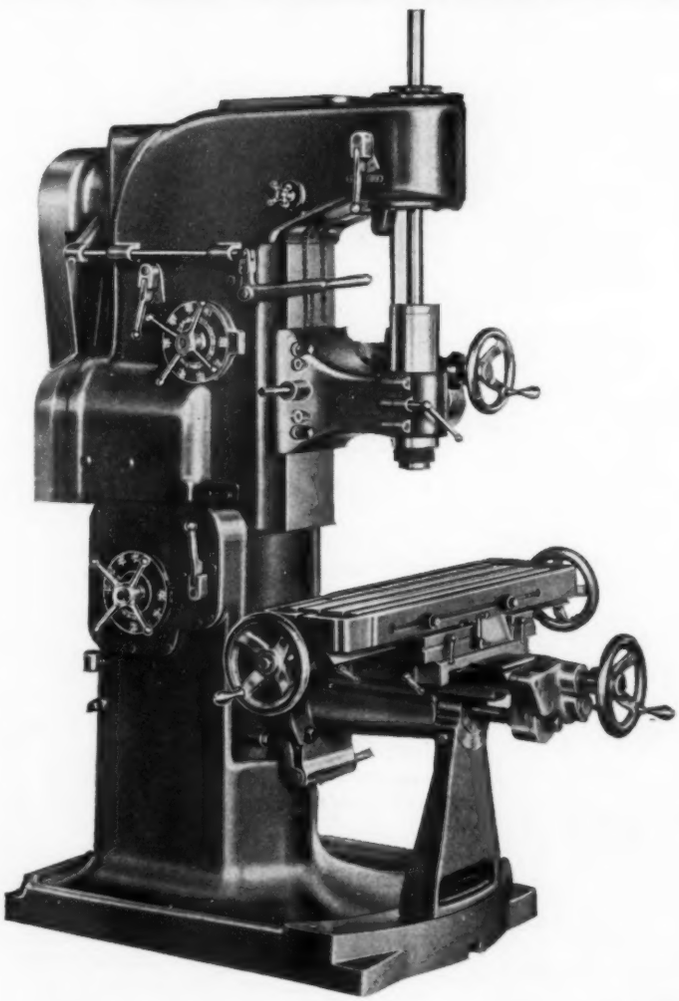
In operation, the operator merely drops the part into the work spindle, throws off the air chuck and pushes the master starting button. An infeed cam then feeds the cutter heads into the work at the proper speed for the part in question. After the infeed cycle is completed, there is a short dwell and then a rapid return to loading position, a limit switch stopping the machine for reloading. For independent finishing of gears, the machine is provided with a rapid infeed which brings both cutter spindles to the correct center distance. The side feed mechanism then imparts an angular rotation to the cutters. At the end of the side feeding cycle, the cam rapidly returns to its original position and then the infeed cam backs the heads out of the work without interference with the gear teeth.

The two cutter spindle heads provided to cut both faces of teeth simultaneously, are actuated by drum-type cams which are interlocked and bring the heads to exact center distance within plus or minus 0.0002 in. Cutter drive shafts, which are connected with the main driving mechanism through sliding 10-spline couplings, are provided with micrometer adjustments for aligning the work spindles. Infeed and rotary-feed mechanisms are operated by





HERE ARE SOME REASONS WHY:



1. Vertical adjustments are quickly made by moving the counterbalanced spindle head—no heavy table unit to raise or lower.
2. Table unit swivels and tilts, thereby increasing speed, efficiency, accuracy, and saving time by eliminating special equipment and re-setting of work.
3. Operator doesn't lose time changing tools because brake stops spindle immediately and Knight method of holding and changing cutters is fast as well as positive.
4. Quick operating, easy reading dials and readily accessible shift lever saves operator's time and makes him a better producer.
5. Operator reduces his machine handling time and his fatigue.

For details regarding these features and for other important profit-producing features you should know about . . . write!

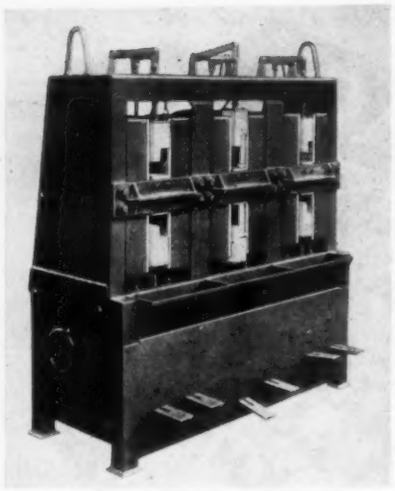
KNIGHT VERSATILE MILLERS ACCURATE - RIGID

W. B. KNIGHT MACHINERY CO.
• ST. LOUIS, MISSOURI •

an independent ½ hp. motor. An interlock is provided so that the feeds cannot be actuated unless work and tool spindles are rotating. Cycle is adjustable through pick-off gears from 45 sec. to 5 min. Tailstocks are of the quick-acting cam type and work is held in the spindle by a spring-set collet chuck. This chuck is released by a double-acting air cylinder.

"Berwick" Three-Phase Electric Rivet Heater

Available either with the six electrodes arranged in two decks of three each, as shown, or with all six electrodes in line, the "Berwick" No. 3 electric 3-phase rivet heater announced by American Car & Foundry Co., 30 Church St., New York, N. Y., will heat any size rivet from ¾ to 1⅛ in. in diameter

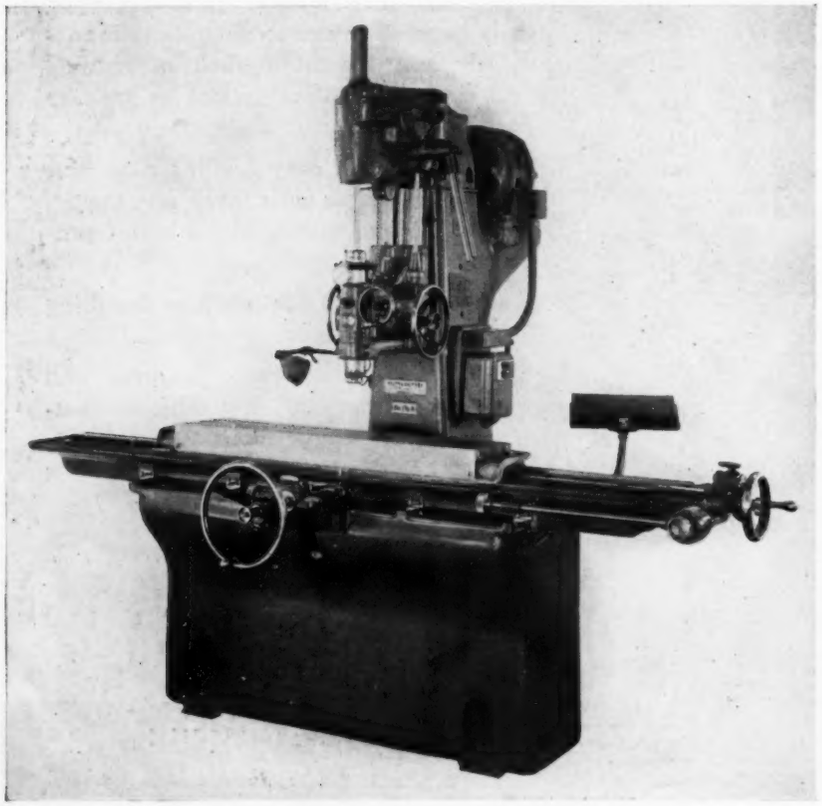


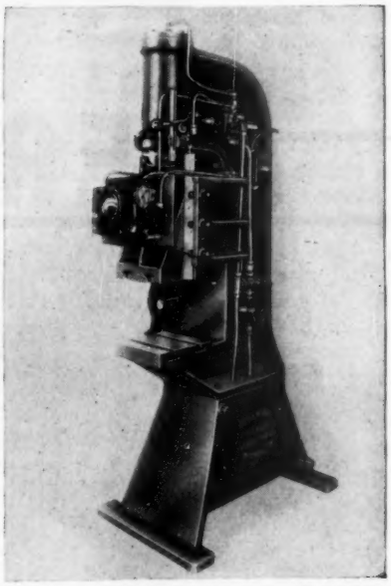
and from 2 to 11 in. under the head. Capacity of each electrode is 345 ⅜x1 in. rivets per hour per electrode. Production of heated rivets of larger sizes is smaller.

Pratt & Whitney No. 1 1/2B Jig Borer

Pratt & Whitney, Div. Niles-Bement-Pond Co., Hartford, Conn., has announced the development of the No. 1½ B jig borer. In principle, this machine is like the larger No. 2A and No. 3B jig borers and is capable of working to close tolerances of ten-thousandths. The machine illustrated has a special long table with a 10 x 48 in. working surface and a 42 in. longitudinal travel. Variable-speed spindle drive is through hardened spiral-bevel gears running in an oil spray. There are eight spindle speeds ranging from 130 to 1,800 r.p.m. and the machine is claimed to be equally adaptable for drilling, boring or reaming.

The hardened, ground and precision lapped spindle quill is 3 in. in diameter and has a 5-in. travel which permits boring holes of an unusual depth for a machine of this size. Spindle, which has a No. 2 Morse taper hole, is mounted on permanently sealed, preloaded precision ball bearings. The table traversing screws have no connection with the measuring instruments, and errors or wear in these screws do not impair the accuracy of the work produced by the machine. Measuring instruments provided with the machine are never under any appreciable pressure and are claimed, therefore, to retain their initial accuracy indefinitely.





Greenerd No. 61-ND-E Plastic Forming Press

Equipped with automatic electric time cycle and ram control, the No. 61-ND-E light-duty plastic molding press offered by Greenerd Arbor Press Co., P.O. Box No. 415, Nashua, N. H., is of 15 ton capacity. The hydraulic pump is mounted opposite a 5 hp. motor through the main housing and is connected directly to a 20 gal. oil pump in the base of the press. Attached to the bottom of the ram is a platen or gate guided by two steel ways, both of which are adjustable to compensate for wear.

Control panel is mounted on the front of the press with a stop-start-jog station, process timer, direct reading pressure gage and emergency stop station. Process timer is adjustable from ½ to 6 min. Ram is put into motion by an electrically operated valve by means of a push-button equipped with a timing device which may be set from ¼ to 6

BOLT THREADING? . . . HERE'S THE MACHINE FOR YOUR WORK

Salvaging rusted bolts in large railway shop.

The "RAPIDUCTION" Bolt Threader is designed and engineered from the base up to give you the best performance possible on a wide variety of work.

Built in two sizes, 3/8" to 1 1/2" and 1/2" to 2 1/4", in both single and double spindle models, the "RAPIDUCTION" handles not only standard jobs but, because vise and carriage are free from obstructions, is adaptable to the application of special fixtures for holding unusual jobs of many kinds.

Write today for complete information and specifications.

THE OSTER MANUFACTURING COMPANY

Sales office: 2049 East 61st Street, Cleveland, Ohio
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New York City Showroom and Office, 292 Lafayette St.
Philadelphia Showroom and Office, 111 No. 3rd St.
Threading Headquarters Since 1893

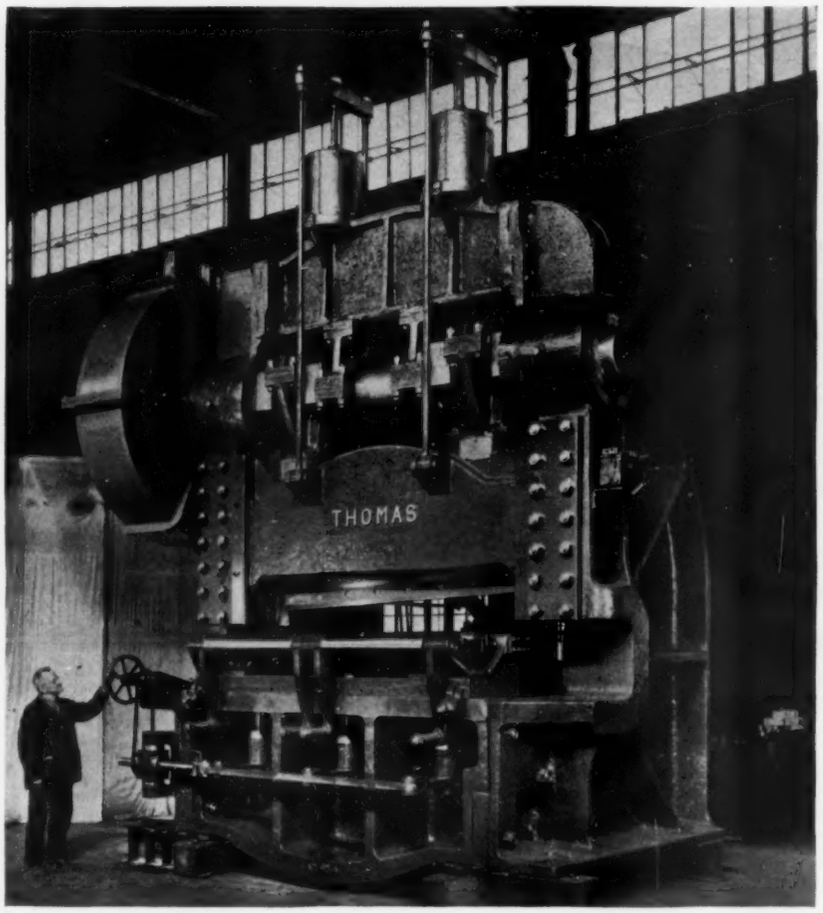
OSTER
THREADING EQUIPMENT
WILLIAMS

min. and which automatically releases and returns the platen to a power stop. Press also is equipped with hand control.

The 12 x 12 in. work table and cross-head have two T-slots for mounting molds or fixtures. Distance from the center of the ram to the back of the throat is 9½ in. and distance from guided head to work table when head is at highest position is 12 in. Stroke of ram is 6 in. Speed of ram down, no load, 59 in. per min. Speed of ram down, 15 ton load, 55 in. per min. Ram has a maximum up pull of 13 tons and pressure may be set on the down stroke from ½ to 15 tons. A similar machine having a maximum capacity of 75 tons also is available.

H.-V.W.-M. Zinc Dropping Test Set

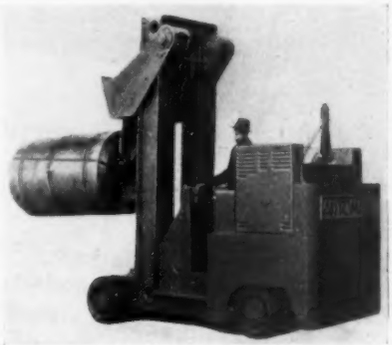
Used for determining the thickness of electro-plated zinc coatings by the Hull & Strausser method, the zinc dropping test set offered by Hanson-Van Winkle-Munning Co., Matawan, N. J., requires only a few minutes to determine the thickness of a coating. Readings are claimed to be sufficiently accurate for control purposes. The specimen to be tested is cleaned by rubbing with a cloth moistened with trichlorethylene and placed 2 or 3 in. under the capillary tip at an angle of 45 deg. from horizontal. The lower stopcock of the set is opened and the test solution allowed to drip on the specimen. Period required from the time the first drop touches the plate until the bare steel is exposed is measured with a stopwatch. Each second elapsing during the test represents a thickness of deposit of 0.00001 in.



Thomas No. 22 Improved Plate Shear

Developed especially for shearing aluminum slabs up to 2-in. thick and 78-in. wide, the No. 22 improved plate shear, offered by Thomas Machine Mfg. Co., Pittsburgh, Pa., has a stroke of 12 in. This stroke is claimed to provide ample opening under the upper knife to clear curled material coming through over the tables. The lower knives have an arrangement for quick adjustment for different thicknesses of material.

Since it has been found that a cleaner cut is obtained on aluminum alloys by separating the shearing knives, a handwheel is provided to adjust the knives for various thicknesses of plates. Herringbone gears are used and these are completely inclosed in a welded gear case. All drive shafts are mounted on Timken bearings. Motor drive is by means of V-belts and the clutch is pneumatically operated through an electrically controlled valve. Ram is counted-balanced by means of air cylinders. Flywheel is of solid rolled steel section with welded hubs. The frame, including housings, ram, table and cross-tie are of cast steel.



"Automatic" Large Ram-and-Fork Tractor

Designed to handle welded-strip steel coils 84 to 96 in. long and weighing 20,000 to 30,000 lb., the "Super-Service" ram and fork tractor announced by Automatic Transportation Co., 101 W. 87th St., Chicago, Ill., has a wheel base of 90 in. and a turning radius of 125 in. Over-all length is said to be short enough so that the tractor will operate in a right-angle aisle of 139¾ in. Hoisting and lowering of the carriage and load are accomplished by means of two double-strand alloy steel roller

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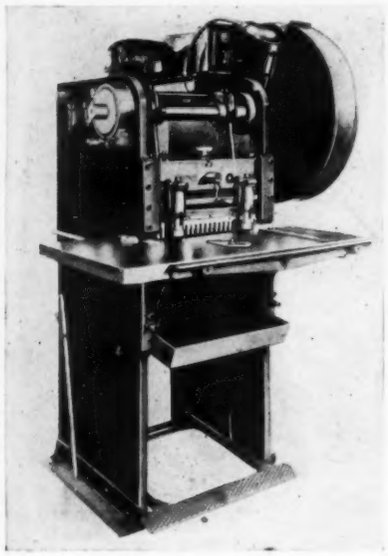
chains operating from a lift unit powered by a heavy-duty motor through a combination worm and spur gear transmission. The "Steer-O-Matic-Drive" included in the design of this unit is a combination drive unit and motorized steering turntable controlled from the operator's station. Drive unit consists of a double-reduction spur gear transmission powered by a heavy-duty motor.



Northill High-Speed Notching Shear

Developed for working sheet metals in aircraft construction, the counter-thrust square shear introduced by Northill Co., Inc., 5221 San Fernando Road W., Los Angeles, Calif., is claimed to cut and notch intricate shapes economically. It is said that the machine will handle stainless steel up to $\frac{1}{16}$ in. thick, mild steel up to $\frac{3}{32}$ in., and duralumin up to $\frac{1}{8}$ in. Cutting width is 16 in. and maximum cut-off capacity is 16. in. Sheared pieces drop into a pan which delivers them to the front of the machine.

This shear operates at 120 blade r.p.m. and is powered with a 1 hp., 3-phrase electric motor. It is equipped with a multiple point clutch which may be set to take one cut with each pressure on the treadle or to cut continuously as long as the treadle is depressed. Machine is manually fed and, for cut-offs up to 3-in. long, an operator can use the maximum continuous cutting speed. The wide, open-throat of the machine permits end use of the blades for intricate notching operations. Movable slide is vertically adjustable. Each blade has four cutting edges and the upper blade is mitered for notching. Specifications: Over-all height, 67 in.; over-all width, 41 in.; over-all depth, 52 in.; 35½ x 20 in.; cutting width, 16 in.; open throat depth, 7½ in., shipping weight, approximately 1,890 lb.

Ideal "Belden" Revolution Counter

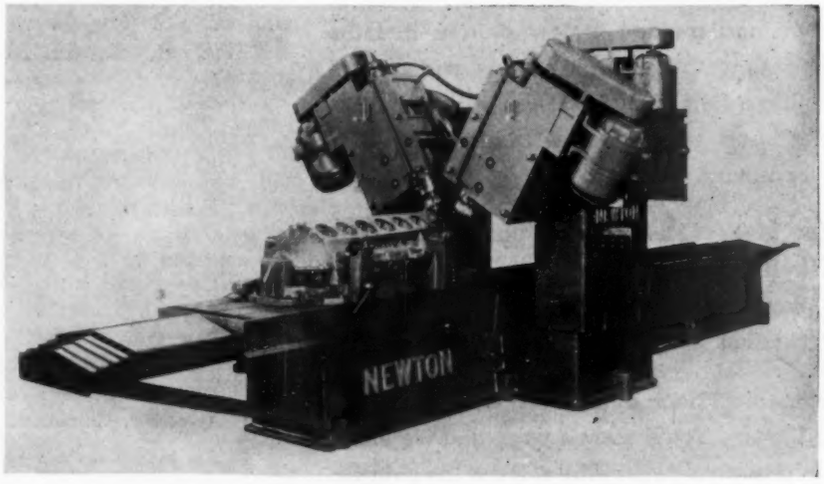
Dial of the Belden revolution counter, offered by Ideal Commutator Dresser Co., 1057 Park Ave., Sycamore, Ill., has scale divisions reading from 0 to 100 and also from 0 to 10,000. One pointer indicates the number of turns from 0 to 100 while the other pointer indicates the number of hundreds of turns counted. This counter automatically will subtract from the total when unwinding turns, since the counter operates in either direction. The assembly consists of a cast-iron base, a dust-tight stamped metal case and

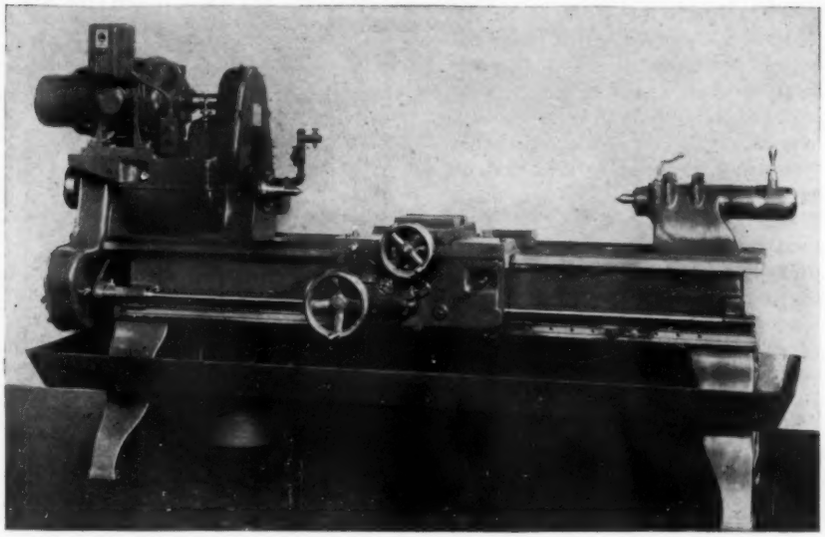
dial, and a flexible coupling for connection to the driving shaft. Dial and case are arranged at a convenient angle for ease in quick reading.

Newton Planer-Type Milling Machine

A number of planer-type milling machines recently have been built by Consolidated Machine Tool Corp., Rochester, N. Y., for various milling operations on large aluminum engine parts. The unithead, planer-type milling machine shown mills three surfaces simultaneously on an aluminum crank case. The other machines do straddle milling of bearing locks on crank cases and surface milling of top, bottom and sides of aluminum cylinder heads. The machine shown has three swiveling unit heads, two on the front cross-girt and one on the back. Spindle heads are individually motor driven with the motors mounted directly on the heads. Spindles are mounted in anti-friction bearings Heads swivel through a wide arc and are adjustable horizontally on the cross-girt.

Adjustable trip dogs, on the side of the planer table, control rapid traverse and feed through a complete cycle, which stops automatically. Levers for manually starting the cutting cycle and the rapid return are provided at the front and back of the uprights. With these levers, table can be stopped and started at any point. Machine also is arranged so that it can be unloaded from either end of the bed. A telescoping guard protects the table bearing surfaces on the bed of this machine.





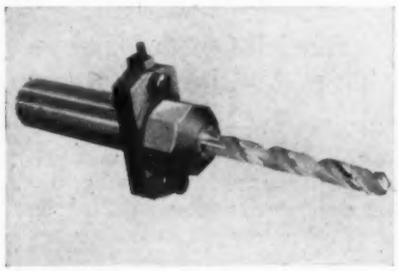
Reed-Prentice Plain Single-Purpose Lathe

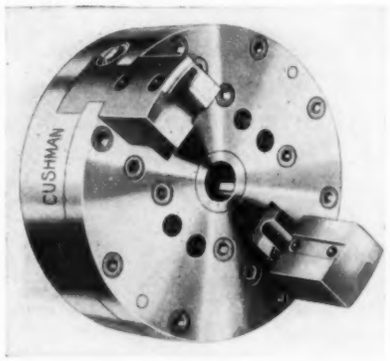
Designed primarily for heavy-duty turning of shells, rifles, gun-barrels and similar work, the single-purpose plain turning lathe announced by Reed-Prentice Corp., Worcester, Mass., swings 16½ in. over the ways. Swing over the carriage bridge is 10⅜ in. and distance between centers when using a cam-type tailstock on a 5 ft. bed is 17 in. Beds 5, 6, 7, 8, and 10 ft. long can be furnished. Weight of the lathe with the 5 ft. bed is 2,900 lb.

Spindle speeds and feeds are obtained with pick-off gears between the motor and the headstock and between the spindle and the feed rod mechanism. Oil pan is furnished as standard equipment, while oil-pump equipment for lubricant supply can be provided if desired.

"Universal Adjustable Collet Chuck

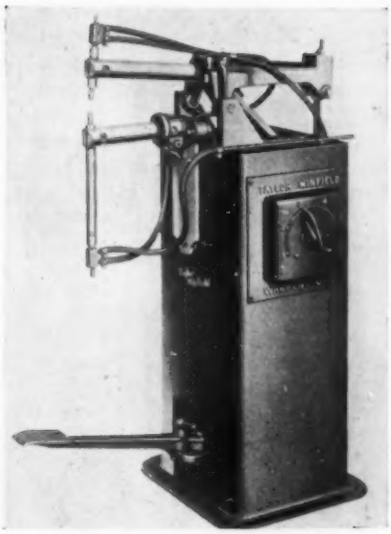
Universal Engineering Co., Frankenmuth, Mich., offers an adjustable collet chuck which is said to be epecially adapted for holding drills and reamers in both hand and automatic screw machines. This chuck can be adjusted to align the tool with the spindle, compensating for any wear in the turret slide. Keys are provided so that the chuck flanges can be set at right angles to the turret slide, simplifying correct setting of the tools. Should adjustment be necessary in two directions, the keys can be removed. Longitudinal adjustment of the drill can be made through the collet and the drill can be set to any length desired.





Cushman No. 422A-1 Two-Jaw Chuck

Features of the No. 422A-1 Chuck offered by Cushman Chuch Co., 806 Windsor St., Hartford, Conn., include a one-piece steel body with a hardened steel face in which the jaws are inclosed. The hardened alloy-steel operating screw is held by a self-aligning thrust bearing which completely encircles the neck of the screw and assures accurate alignment with the mating piece of the master jaws. This chuck is available in a full range of sizes for direct mounting to American Standard spindles and easily can be attached to the threaded type of spindle nose by means of an intermediate plate.



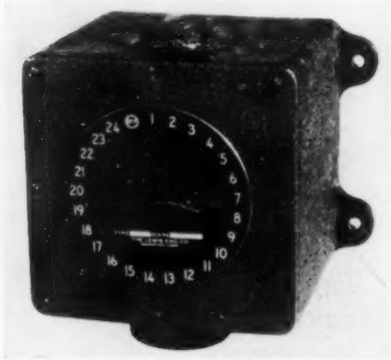
Taylor-Winfield "W" Improved Spot Welder

Having a one-piece, all-welded steel frame, the Type W foot-operated spot welder offered by The Taylor-Winfield Corp., 14307 Third Ave., Warren, Ohio, is available with throat depths ranging up to 36 in. Horns have an adjustable separation from 3 ⅝ to 15 ¼ in. Transformer capacities are 10, 15 and 20 kva. of any commercial voltage and frequency. All electrical parts, except the low voltage members, are fully inclosed. Net weight ranges from 460 to 560 lb.

Cramer Model A Interval Timer

Driven by a slow speed, self-starting synchronous motor, the Model A interval timer, offered by R. W. Cramer & Co., Inc., 67-69 Irving Place, New York, N. Y., is available with normally open, normally closed or double-throw contacts. A wide range of timing scales is available. The style shown is for the

Model 0A-101-M timer which has a 1 min. maximum time scale with dial divisions in single seconds. It is equipped with automatic stop and delayed start buttons. Standard timing scales range up to an 8-hr. dial with 15-min. divisions. These timers are available for 110 or 220 volt service and for 25, 50 and 60 cycle circuits.



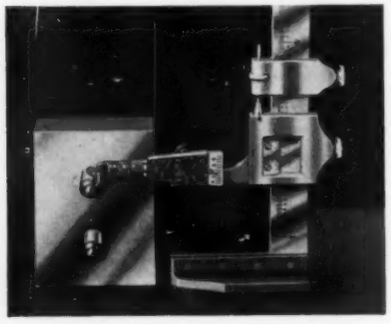
Lewis No. 80S Small Moisture-Proof Switch

Available either for wall mounting, as shown, or for panel mounting, the No. 80S moisture-proof switch offered by the Lewis Engineering Co., Naugatuck, Conn., weighs approximately 5 lb. and measures 6 in. wide, 6 in. high and 7 in. deep. Construction of the switch mechanism is similar to that of other Lewis rotary-selector thermocouple switches. The switch makes and breaks both conductors of the circuit. All switches are supplied with an "off" position. Standard switches are stocked with 4, 9, 12, 18, 24 and 28 thermocouple positions.

"Universal Junior" No. 564 Indicator

The "Universal Junior" No. 564 indicator, introduced by The L. S. Starrett Co., Athol, Mass., is claimed to be completely flexible. The ball contact is frictionally held and may be set to touch the work at an desired angle. Sleeve which holds the contact point can be turned completel around and the entire indicator can be swung through a full circle when mounted on the shank.

The indicator can be mounted on the side of one end of the shank or on the top of the other end, when used in the tool post of a lathe, or it can be removed from the shank and attached to the jaw of a height gage, as shown. Readings are in thousandths of an inch over a range of 0.012 in., by means of a needle and graduated scale. Shank is approximately $\frac{1}{4}$ x $\frac{1}{2}$ x 5 in., and the indicator case is $2\frac{1}{2}$ in. long, $\frac{1}{4}$ in. thick and tapers from 11/16 in. at the scale end to $\frac{1}{8}$ in. at the contact point.

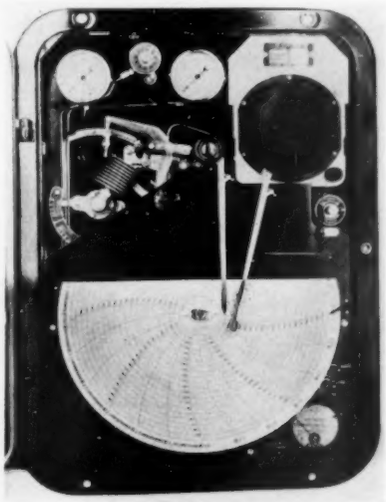


Fairbanks Lift-Jack Platform Truck

By pulling down the handle, the truck of the lift-jack platform truck offered by The Fairbanks Co., 393 Lafayette St., New York, N. Y., is lifted off the front legs and can be moved easily. To remove the jack, it is necessary only to lift the handle and roll it out. The jack will stand vertically by itself. Fittings and jack can be supplied without the platform when desired.

Bristol "Free-Vane" Continuous Controller

A pneumatic-reset potentiometer controller for continuous processes, combining the "Pyromaster" potentiometer temperature measuring system and the reset "Free-Vane" air-operated control mechanism, has been announced by The Bristol Co., S. Main St., Waterbury, Conn. This instrument can be used for controlling automatically temperatures up to 3,000 F., and is offered as a pyrometer and also as a resistance thermometer. A record of the controlled temperature is made on a 12-in. circular chart. Throttling range and rate of reset may be changed over a wide scope by the use of finger adjustments to suit the requirements of the process involved.



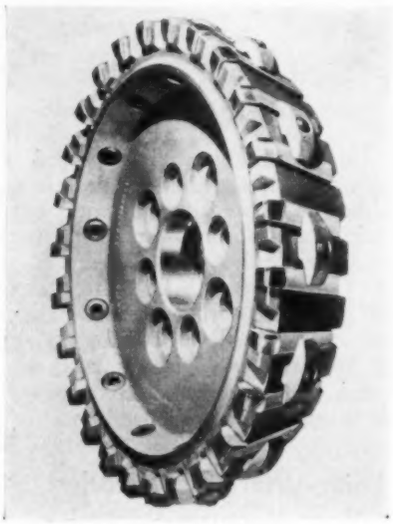
Wheelco Portable Potentiometer

A portable potentiometer, offered by Wheelco Instruments Co., 1112-14 Milwaukee Ave., Chicago, Ill., has been designated specially for field and laboratory service. Scales are obtainable calibrated in millivolts or in degrees Fahrenheit or Centigrade, or both.

Ex-Cell-O Standard Tipped Milling Cutters

Ex-Cell-O Corporation, 1228 Oakman Blvd., Detroit, Mich., in cooperation with the Carboloy Co., has developed a new standard line of tungsten carbide milling cutters, in which the number of blades in

each diameter, the adaption for machine drive, and the tip sizes have been revised. These cutters incorporate the "Continental" Type RC blade lock, in which tapered blades are fit into tapered seats and the blades are locked in place in pairs with an external clamp as shown in the illustration.

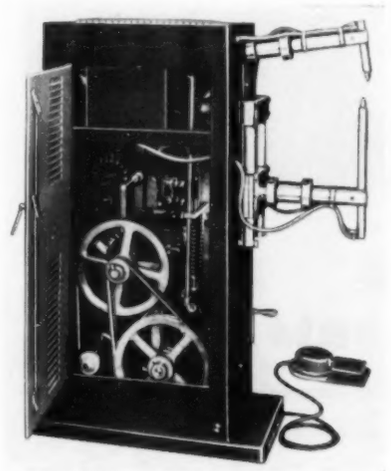


Willson No. 200 "Rotiform" Respirator

More than 30 sq. in. of effective filtering surface is provided by the "Rotiform" felt filter used in the No. 200 respirator offered by Willson Products, Inc., Reading, Pa. This respirator has been approved by the U. S. Bureau of Mines for protection against Type A dusts, such as are produced in industrial operations of grinding, crushing and general processing of materials. A metal cover cap protects the filter from contact with the wearer's hands, keeping it clean of surface dirt, grease and oil. Spectacles or safety goggles can be worn readily with this respirator.

Babaco "Two-In-One" Foot Control Switch

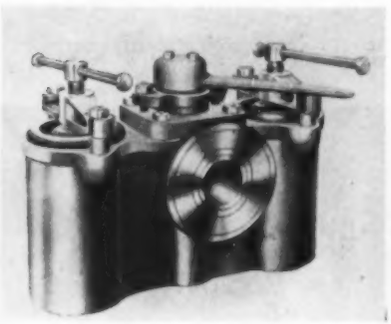
Intended for use on drill presses, small lathes and other individual-motor driven equipment, the Type SS-1000 "Two-in-One" safety foot control switch announced by The Babaco Co., 447 W. 19th St., New York, N. Y., permits the operator to control the machine while both of his hands are free to hold the work. This unit measures approximately 4½ in. high, 4½ in. wide, and 4½ in. deep, over-all. It is rated at 10 amp., 110 volts a.c., and is of sufficient capacity to provide control for a ½ hp. motor.



Pier Automatic "Ace" Spot Welder

Pier Equipment Mfg. Co., 801 Cross St., Benton Harbor, Mich., offers a motor-driven, automatic spot welder having a 3 to 1 ratio of speed variation through a Reeves "Vari-Speed" transmission. A mechanical weld timing control with which welding time can be set to as fast as 1½ cycles or 1/40 sec. is provided. Once set for a given job, welding time and pressure remain constant.

Speed of operation is adjusted through a convenient crank extending through the lower front of the welder. Standard units are made for speeds from 40 to 120 strokes per min. Higher speeds are available. Connecting rod has provisions for adjusting length of stroke to 1, 1½ and 2 in. These welders are made in 15, 20, 30, and 50 kw. sizes.



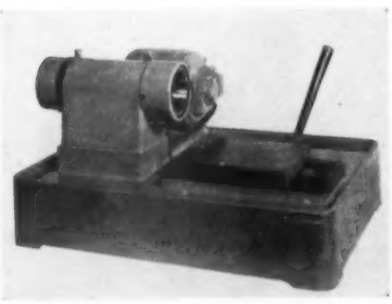
"Duoflo" Suction Oil Strainers

The "Duoflo" suction oil strainer offered by Sheffler-Gross Co. Inc., Fifth and Chestnut Sts., Philadelphia, Pa., has two perforated baskets held in place by the covers. This construction permits one strainer to be cleaned while the other is in operation. It is necessary only to turn the plug cock, deflecting the oil through the other strainer and remove the basket to be cleaned.

These strainers are made in 1½, 2, 2½, 3 and 4 in. sizes. All suction strainers are flanged and drilled according to standard specifications. Each assembly is hydrostatically tested to 150 lb. per sq. in. They are said to be particularly applicable to industrial oil burning furnaces and oil processing lines.

Cogsdill Combination Bearing-izing Machine

Suitable for driving either internal or external "Bearing-izing" tools, this bench-type machine announced by Cogsdill Mfg. Co., Inc., 6511



Epworth Blvd., Detroit, Mich., has a lever-operated table which can be equipped with an outboard center for external work or with a fixture for internal work. Spindle is constructed with a bell end having a taper fit for holding the external type of tools. Back of this bell end is the conventional Morse taper for draw-bar-type tool shanks. Provision is made in the construction for the installation of a spring-operated telescoping center which is required when processing an external surface up to a shoulder. Spindle is mounted in precision ball bearings and provided with an inclosed flywheel to prevent vibration.

"Great Seal" Hose

Designed to guard against accidental explosions caused when both gas lines are subjected to sparks and hot metals in welding operations, the "Great Seal" welding hose No. NY-10003, offered by New York Belting & Packing Co., 1 Market St., Passaic, N. J., is constructed of an oxygen and acetylene resisting rubber tube covered with two or three plies (according to size) of strong lightweight duck. Over these duck plies is braided the safety ply of high tensile asbestos yarn, which prevents hot sparks and metals from penetrating the hose. This hose is available in $\frac{1}{4}$, 5/16, $\frac{3}{8}$ and $\frac{1}{2}$ in. inside diameters.

"Steel Grip" Leather Finger Guard

A chrome leather finger guard, which protects the thumb, fore and middle fingers against injuries in grinding and sorting operations, is offered by the Industrial Gloves Co., 721 Garfield Blvd., Danville, Ill. The guard is worn over the bare hand and is available both for right and left-hand use. It has patches on the fingers and thumb to provide maximum protection.

"Smootharc" Electrodes Now Vacuum-Packed

Harnischfeger Corp., 4400 W. National Ave., Milwaukee, Wis., announce that "Smootharc" welding electrodes now are being packaged in vacuum-packed cans. Electrodes are taken direct from the drying ovens and placed immediately in the containers. Tops are hermetically sealed and the contents are claimed to remain in perfect condition regardless of the degree of moisture present in subsequent storage places.

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TRADE PUBLICATIONS

ARC WELDERS "Multi-Range" arc welders, having dual control are described in a 6-page bulletin offered by the Hobart Bros. Co., Box 1A772, Troy, Ohio.

BLISS PRESSES A fully illustrated, 36-page bulletin recently published by E. W. Bliss Co., 53rd St. and Second Ave., Brooklyn, N. Y., discusses the company's facilities for manufacturing presses and other equipment.

BORING MACHINES "Simplex" precision horizontal boring machines are described in detail in an eight-page bulletin recently published by Stoker Unit Corp., 4548 W. Mitchell St., Milwaukee, Wis.

COMPRESSORS A two-page compressor, available in 1½ and 2 hp. sizes, is described on a catalog page, Form No. 2346, announced by Ingersoll-Rand Co., 11 Broadway, New York, N. Y. Listed as Type 30, these compressors are said to be capable of operating continuously at 200 lb. discharge pressure.

CONVEYORS "Equipping Industry for Continuous Production" is the title of a 32-page bulletin offered by Mathews Conveyor Co., Ellwood City, Pa. This book gives a pictorial presentation of a complete line of conveyor equipment.

COOLANT PUMP The "Midget" coolant pump is described in a leaflet offered by Narragansett Products Corp., 45 Baker St., Providence, R. I.

DIAL GAGES A four-page bulletin discussing the features of "Shockless" dial gages and listing users of these gages as of January, 1938, is being distributed by B. C. Ames Co., Waltham, Mass.

DISK GRINDING "Modern Methods of Gardner-Grinding" is the title of a 24-page bulletin just published by Gardner Machine Co., Beloit, Wis. Standard and special disk grinding machines of various types are illustrated.

DRILL UNITS "Twin-Ram" hydraulic drill units are discussed in detail in a six-page bulletin offered by Le Maire Tool & Mfg. Co., 2657 S. Telegraph Rd., Dearborn, Mich.

ELECTRIC CRANES Electrical equipment for traveling electric cranes is discussed in detail in a 12-page bulletin, No. GEA-2545, published by General Electric Co., Schenectady, N. Y.

ELECTRIC MOTORS Two four-page bulletins, Form No. 731 and 938, offered by U. S. Electrical Motors, Inc., 200 E. Slauson Ave., Los Angeles, Calif., discuss the features of standard horizontal "Uniclosed" motors and describe the method used in insulating and winding "U. S." motors, using asbestos insulation.

ELECTROTINNING The sodium stannate-sodium acetate process of electrotinning is discussed in a 12-page technical service manual recently issued by the Electroplating Div., E. I. du Pont de Nemours & Co., Inc., Wilmington, Del. This manual outlines the recommended practice for the operation of the process and presents standard methods of preparing, controlling and analyzing the solution.

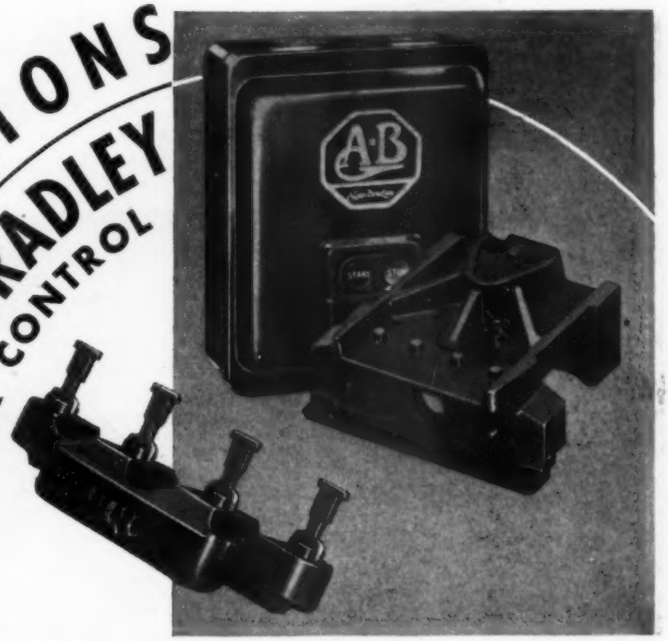
GAS-FIRED OVENS Bulletin No. 106, offered by the Gehnrich Corp., Skillman Ave. and 35th St., Long Island City, N. Y., discusses the features of standard gas-fired ovens and air heaters for industrial baking, drying and heat-treating operations.

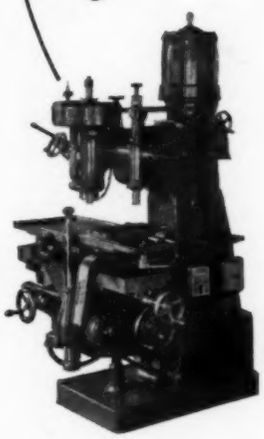
GRINDERS "Autostart" grinders and buffers are listed and described in a four-page bulletin, Form No. 970, offered by U. S. Electrical Motors, Inc., 200 E. Slauson Ave., Los Angeles, Calif.

GRINDERS Bulletin No. G-410, a 28-page fully illustrated catalog announced by Cincinnati Milling Machine and Cincinnati Grinders, Inc., Cincinnati, Ohio, discusses the features of 6 and 10 in. plain hydraulic grinding machines.

INDUCTION MOTORS Bulletin No. GEA-1844A, announced by General Electric Co., Schenectady,

GORTONS and ALLEN-BRADLEY MOTOR CONTROL





The most intricate patterns can be reproduced faithfully on Gorton Duplicators to tolerances as close as practical for mold work (.001" and closer).

While working to achieve the utmost simplicity in their powerful Bulletin 709 Automatic Solenoid Starters, Allen-Bradley Co. also simplified their tool room work with Gorton Duplicators. The original molds for the 4-pole cross bars and thermal relay blocks above were cut to dimensions on the Duplicator with milling cutters. All duplicate and multiple cavity molds are produced with the duplicating attachments.

Mold costs have been so much reduced by Gortons that it pays now to have several identical molds on hand. This saves in molding operations and prevents any chance of holding up production of plastic parts for lack of molds to work with.

GEORGE GORTON MACHINE CO
1103 13TH ST. RACINE, WIS.

N. Y., discusses the features of squirrel-cage type, multi-speed induction motors having 2, 3 or 4 synchronous speeds.

LABOR LAWS "Laws Limiting Hours of Employment for Men as of January 1, 1938," is the title of a report, Serial No. R-712, prepared by the Labor Law Information Service Section of the United States Department of Labor. This is a reprint from the Monthly Labor Review of the Bureau of Labor Statistics, February, 1938.

LABORATORY FURNACES A four-page bulletin listed as Leaflet No. 23-TF is being distributed by Harold E. Trent Co., Philadelphia, Pa. This bulletin discusses the features of electrically heated laboratory apparatus.

LAMINATED GEARS Engineering and design information on gears cut from "Spauldite" laminated phenolic material is given in a 16-page bulletin recently published by Spaulding Fibre Co., Inc., 310 Wheeler St., Tonawanda, N. Y.

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Scientifically heat treated to a true spring temper, "Rivett Mark" collets resist wear and hold their spring longer than collets of any other make. As standard equipment on all makes of lathes and millers, (see Rivett Bulletin 100B) they may be ordered for immediate delivery from the following stocks:—
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18 Riverview Road, Brighton
RIVETT
LATHE & GRINDER INC.
BRIGHTON, BOSTON, MASS.

MAGNET WIRE A four-page bulletin being distributed by Anaconda Wire and Cable Co., 25 Broadway, New York, N. Y., discusses the features of "Vitrotex" glass-covered magnet wire.

MAGNETS Spout magnets, available with or without automatic shut-off gates, are described in Bulletin No. 92-B published by Stearns Magnetic Mfg. Co., Milwaukee, Wis.

MATERIALS HANDLING Form No. G2-38, offered by the Cleveland Crane & Engineering Co., Wickliffe, Ohio, discusses overhead materials handling systems suitable for loads up to 5 tons.

METAL EDGE BOXES "Planned Packaging" is the title of an 18-page bulletin offered by National Metal Edge Box Co., Callowhill at 12th St., Philadelphia, Pa. This fully illustrated bulletin discusses in detail the features of metal-edge packaging.

POTENTIOMETERS Bulletin No. 507, announced by The Bristol Co., Waterbury, Conn., describes "Pyromaster" recorders, recorder-indicators and dial indicators.

PRICE LIST Prices of Vascoloy-Ramet wire drawing dies, bolt sizing dies and mandrels are tabulated in a 12-page bulletin being distributed by Illinois Tool Works, 2501 N. Keeler Ave., Chicago, Ill.

PUSHBUTTON STATIONS Pushbutton stations and other CR-2940 manual electric control for use in the control circuits of magnetic controllers are described in a 12-page bulletin, No. GEA-2473, announced by General Electric Co., Schenectady, N. Y.

PYROMETER UNIT A complete pyrometer unit with accessories ready for installation is described in a four-page bulletin recently published by The Lewis Engineering Co., Naugatuck, Conn.

SCREW DRIVERS The Haskins method of applying screws and nuts is discussed in a six-page bulletin offered by R. G. Haskins Co., 4630 W. Fulton St., Chicago, Ill.

SMALL MOTORS Two-pole unidirectional and reversing motors having ratings ranging from 0.00025 to 0.0275 hp. are described in Motor Data Sheet No. M-11 offered by Barber-Colman Co., Rockford, Ill. Fan blades for use with these motors also are shown.

STATE LABOR LAWS Bulletin No. 654, entitled "State Labor

Legislation, 1937," prepared by Labor Law Information Service, includes Workmen's Compensation Legislation. Published by the United States Department of Labor, this bulletin is offered for sale by the Superintendent of Documents, Washington, D. C., at a price of ten cents per copy.

STEELS Main characteristics of various high-speed and other tool steels are discussed in a four-page bulletin offered by A. Milne & Co., 741 Washington St., New York, N. Y.

TEST INSTRUMENTS Standard and special promoters and testing instruments are shown on Leaflet No. M-370 now being mailed by Thwing-Albert Instrument Co., 3339 Lancaster Ave., Philadelphia, Pa.

TESTING INSTRUMENTS Special testing instruments for the laboratory and factory are discussed in a 16-page bulletin, No. 386, published by Commercial Engineering Laboratories, Detroit, Mich.

TURRET LATHES Economies effected through the application of modern turret lathes are discussed in a four-page bulletin now being mailed by Gisholt Machine Co., Madison, Wis.

TURBINE PUMPS "De Laval Pumps for All Purposes" is the title of a 16-page booklet discussing the features of various standard types of turbine pumps manufactured by DeLaval Steam Turbine Company, Trenton, N. J.

VENTILATING FANS Several standard models of ventilating fans are shown in a folder being distributed by Reynolds Electric Co., 2650 West Congress St., Chicago, Ill.

WAGES AND HOURS "The Case for Freedom from Federal Control of Wages and Hours" is the title of a 24-page bulletin being distributed by Machinery and Allied Products Institute, 221 North La-Salle St., Chicago, Ill. The problem of federal control is discussed in detail.

WAGE RATES No. 26 in a series of economic bulletins being published by Farrel-Birmingham Co., Ansonia, Conn., is a booklet entitled "Rigid Wage Rates and Cost." Prepared by Allen W. Rucker and N. W. Pickering, this bulletin points out that "It is evident that business recovery based upon a reduction of industrial costs and prices cannot begin until there is a substantial reduction in wage rate, the major factor in costs."

PATENTS

March 1, 1938

Metal-Working Machinery

Apparatus for Cutting Grooved Rolls. Hans Becker, Dusseldorf, Germany. Patent 2,109,454.

Grinding Machine. Raymond H. Cramer, Newark, N. J., assigned to General Motors Corp., Detroit, Mich. Patent 2,109,524.

Grinding Machine. Herbert Vanderbeek, Canton, Ohio, assigned to The Timken Roller Bearing Co., Canton, O. Patent 2,109,600.

Gas Case-Hardening Furnace. Leon Salves, Billancourt, France, assigned to Louis Renault, Billancourt, France. Patent 2,109,711.

Machine for Making Bolts and the Like. John H. Friedman, Tiffin, Ohio, assigned to The National Machinery Co., Tiffin, Ohio. Patent 2,109,918.

Method and Machine for Slitting Metal. William W. Leach, Warren, Ohio, assigned to The Aetna-Standard Engineering Co., Youngstown, Ohio. Patent 2,109,921.

Machine Tool. Worthy J. F. Forward, Rochester, N. Y., assigned to Consolidated Machine Tool Corp., Rochester, N. Y. Patent 2,109,960.

Apparatus for Shearing Metal. Aaron Marofsky, Chelsea, Mich. Patent 2,110,047.

13" x 5' South Bend Quick Change Gear Underneath Belt Motor Driven Precision Lathe on a manufacturing operation.
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68 Sizes and Types of Lathes for every purpose.

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Bulletin No. 13-C illustrates, describes and prices the different models of the 13-inch lathe. Copy sent free, upon request.

SPEED, precision, versatility, and smooth, quiet operation are qualities of the new 13-inch South Bend Series "T" Lathes that have made them the choice of engineers and mechanics everywhere. Hundreds of manufacturing plants, machine shops, and tool rooms depend upon the rigid construction and fine workmanship of these lathes for the most precise tool and gauge work, and speedy, accurate production jobs.

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SOUTH BEND *Precision* LATHES
MODERN LATHES FOR MODERN INDUSTRY

Parts and Mechanisms

Variable Speed Transmission. Louis A. Graham, Milwaukee, Wis. Patent 2,109,695.

Motor Speed Controller. Emanuel Nielsen, Racine, Wis., assigned to Scovill Mfg. Co., Waterbury, Conn. Patent 2,109,732.

Screw Locking. Johann Meersteiner, Saaz, Czechoslovakia, assigned to Bechert & Co., Drahtstifte-, Schrauben- und Stahlindustrie-Aktiengesellschaft, Saaz, Czechoslovakia. Patent 2,109,778.

Method of and Apparatus for Operating a Cutting Tool. Darwin Taft, Bainbridge, N. Y., assigned to American Plastics Corp. Patent 2,109,786.

Power Transmission Mechanism. Alain Madlé, New York, N. Y., assigned to Erban Operating Corp., New York, N. Y. Patent 2,109,845.

Apparatus for Accurately Positioning Work Relative to a Tool. John F. Price, Fulton, N. Y., assigned to Oswego Falls Corp., Fulton, N. Y. Patent 2,109,849.

Milling Mechanism. William Dzus, West Islip, N. Y. Patent 2,109,969.

Clinch Nut. Plummer E. Double, Detroit, Mich. Patent 2,110,039.

Abrasive Wheel and Mount Therefor. Herbert S. Indge, Westboro, Mass., assigned to Norton Co., Worcester, Mass. Patent 2,110,086.

Processes

Method and Apparatus for Detecting Flaws in Metallic Bodies. Walter C. Barnes, Lake Bluff, and Henry W. Keevil, Highland Park, Ill. Patent 2,109,455.

Resistance Welding Method. Jesse J. Brown, Syracuse, N. Y. Patent 2,109,461.

Method of Making Railway Car Axle Journal Bearings. Wayne W. Pattison and Frederick J. Sandner, Detroit, Mich., assigned to Bohn Aluminum & Brass Corp., Detroit, Mich. Patent 2,109,890.

Tools and Accessories

Apparatus for Testing Hardness. William I. Ballentine, La Porte, Ind. Patent 2,109,521.

Bearing Jig. Imer E. Hixson, Edom, Calif. Patent 2,109,568.

Gear Puller. Charles F. Carlborg, Portland, Ore. Patent 2,109,740.

Industrial Platform. Frederick H. Shepard, Jr., West Newton, and Nathaniel Warshaw, Mattapan, Mass., assigned to Lewis-Shepard Co., Watertown, Mass. Patent 2,109,784.

Portable Surface Grinding Machine. Edwin G. Moffett, Mobile, Ala. Patent 2,109,827.

Knitted Buffing Wheel. Stephen W. Lippitt, Cleveland, Ohio. Patent 2,109,905.

Threading Die. William O. Thewes, North Ridgeville, Ohio, assigned to The Ridge Tool Co., Ridgeville, Ohio. Patent 2,110,099.

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THE DRIVING MOTOR MOUNTED ON ARM PROVIDES PROPER BALANCE FOR BETTER BALANCE OF ARM AND HEAD
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CINCINNATI BICKFORD

March 8, 1938

Metal-Working Machinery

Machine Tool Structure (Miller). Benjamin P. Graves, Edgewood, R. I., assigned to Brown & Sharpe Mfg. Co., Providence, R. I. Patent 2,110,295.

Static Balancing Machine. John Leonard Taylor, Milwaukee, Wis. Patent 2,110,343.

Grinding Machine. Charles H. Kasch, Davenport, Iowa, assigned to Micro-Westco, Inc., Bettendorf, Iowa. Patent 2,110,441.

Soldering or Welding Machine. Alfred Auguste Adolphe Rossignol, Alexis Eugene Quatremains, and Auguste Louis Rossignol, Asnieres, France. Patent 2,110,529.

Welding Machine. Robert W. Mitchell, Westmount, Quebec, Can. Patent 2,110,632.

Wireworking Machine. Barnard Heilman and Earl Peck, Detroit, Mich., assigned to L. A. Young Spring & Wire Corp. Patent 2,110,665.

Gang Slitting Shear. John A. Smitmans, Pittsburgh, Pa., assigned to United Engineering & Foundry Co., Pittsburgh, Pa. Patent 2,110,776.

Up-Cut Open-Throat Shear. Frank B. Streine, Pittsburgh, Pa., assigned to United Engineering & Foundry Co., Pittsburgh, Pa. Patent 2,110,777.

Wireworking Machine. Ezra A. Frantz, Weatherford, Tex. Patent 2,110,793.

Parts and Mechanisms

Joint. John Arthur Gross, Wilmette, Ill., assigned to Thompson Products Inc., Cleveland, Ohio. Patent 2,110,148.

Machine Tool Transmission and Control. Walter M. Pohl and Joseph B. Armitage, Wauwatosa, Wis., assigned to Kearney & Trecker Corp., West Allis, Wis. Patent 2,110,173.

Hydraulic Power Unit. William Neal Edwards, White Deer, Tex. Patent 2,110,393.

Sectional Drive. Paul Simonds, Milwaukee, Wis., assigned to The Oilgear Co., Milwaukee, Wis. Patent 2,110,428.

Drill Press Adjustment. Herbert E. Tautz, Milwaukee, Wis., assigned to The Delta Mfg. Co., Milwaukee, Wis. Patent 2,110,537.

Grinding Wheel Mounting. Hugo W. H. Beth, Worcester, Mass., assigned to Norton Co., Worcester, Mass. Patent 2,110,619.

Hydraulic Torque Transmitting Mechanism. William Fraser, Liverpool, England. Patent 2,110,722.

Hydraulic Variable Speed Transmission. Ernst Selbold, Heidenheim-on-the-Brenz, Germany, assigned to American Voith Contact Co., Inc., New York, N. Y. Patent 2,110,741.

Processes

Method of Making Splined Shafts. Karl Rabe, Stuttgart, Germany. Patent 2,110,275.

Manufacture of Pipes and the Like From Sheet Metal. Walter Reginald Hume, Melbourne, Victoria, Australia, assigned to Hume Steel Ltd., Melbourne, Australia. Patent 2,110,378.

Method and Apparatus for Applying Metal Coatings. Purling A. Bleakley, Hollywood, Calif., assigned to The Gillord Corp., Delaware. Patent 2,110,755.

Method and Apparatus for Cutting and Treating Metals. Robert L. Wagner, Astoria, N. Y., assigned to Union Carbide & Carbon Corp., New York, N. Y. Patent 2,110,781.

Tools and Accessories

Cutting Torch. William J. Sherman, Bayonne, N. J., assigned to Air Reduction Co., Inc., New York, N. Y. Patent 2,110,181.

Welding Device. David T. May, Port Washington, N. Y., assigned to Bell Telephone Laboratories, Inc., New York, N. Y. Patent 2,110,271.

Hydraulic Pressure Gauge. Selden T. Williams, Bellerose, N. Y., assigned to Scovill Mfg. Co., Waterbury, Conn. Patent 2,110,386.

Hand Lift Truck. George Quayle, Philadelphia, Pa., assigned to The Yale & Towne Mfg. Co., Stamford, Conn. Patent 2,110,424.

Ventilated Buffing Wheel. Harry Zimmerman, Toronto, Ontario, Canada. Patent 2,110,494.

Hone. Harold L. Blood, Worcester, Mass., assigned to The Heald Machine Co., Worcester, Mass. Patent 2,110,756.

Welding Tool. George Hogg, Forest Hills, and John W. Free and George R. Carroll, Aliquippa, Pa., assigned to Jones & Laughlin Steel Corp., Pittsburgh, Pa. Patent 2,110,832.

March 15, 1938

Metal-Working Machinery

Engraving Machine. George Gorton, Peter M. Henkes and Fred Steinbrecker, Racine, Wis., assigned to George Gorton Machine Co., Racine, Wis. Patent 2,110,873.

Drilling Machine. Herbert Lindner, Berlin-Wittenau, Germany. Patent 2,110,958.

Lapping Machine. Robert S. Drummond, Detroit, Mich. Patent 2,111,045.

Machine for Finishing Gears. Robert S. Condon, Rochester, N. Y., assigned to Gleason Works, Rochester, N. Y. Patent 2,111,170.

Screw Gauging Machine. Kenneth Edward Summers, Peterborough, England, assigned to The Newall Engineering Co. Ltd., Peterborough, England. Patent 2,111,252.

Apparatus for Lapping. Lester F. Nenninger, Cincinnati, Ohio, assigned to The Cincinnati Milling Machine Co., Cincinnati, Ohio. Patent 2,111,271.

Milling Machine. Herman Horlacher, Cincinnati, Ohio, assigned to The Cincinnati Milling Machine Co., Cincinnati, Ohio. Patent 2,111,288.

Nut Tapping Machine. Benjamin H. Mortus, Shaker Heights, Ohio, assigned to The National Screw & Mfg. Co., Cleveland, Ohio. Patent 2,111,295.

Multiple Automatic Pattern Controlled Milling Machine. Erwin G. Roehm, Norwood, Ohio, assigned to The Cincinnati Milling Machine Co., Cincinnati, Ohio. Patent 2,111,332.

Machine Tool of the Sensitive Table Type. Peter M. Henkes, Racine, Wis., assigned to George Gorton Machine Co., Racine, Wis. Patent 2,111,471.

Parts and Mechanisms

Machine Tool (Automatic Feed). Harold I. Dyer and Oscar J. W. Hedlund, Battle Creek, Mich., assigned to Eaton Mfg. Co., Cleveland, Ohio. Patent 2,110,931.

Material Working Apparatus. Shryock P. McDaniels, Maplewood, N. J., assigned to Western Electric Co., Inc., New York, N. Y. Patent 2,110,998.

Resistance Welding Current Control. Edwin H. Vedder, Swissvale, Pa., assigned to Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. Patent 2,111,013.

Safety Mechanism for Punch Presses. Percy E. Boyd, Detroit, Mich. Patent 2,111,060.

Safety Clutch Release for Punch Presses. Percy E. Boyd, Detroit, Mich. Patent 2,111,061.

Multiple-Belt Variable Speed Unit. Paul B. Reeves, Columbus, Ind., assigned to Reeves Pulley Co., Columbus, Ind. Patent 2,111,077.

Sectional Gear. Thomas A. Byers, Spokane, Wash. Patent 2,111,088.

Guidway for Carriages. Frank A. Fritzsch, Cincinnati, Ohio, assigned to The Lodge & Shipley Machine Tool Co., Cincinnati, Ohio. Patent 2,111,096.

Clutch Mechanism. Edwin L. Connell, Cleveland, Heights, Ohio. Patent 2,111,280.

Machine Tool Speed Change Mechanism. Edward C. Bullard, Fairfield, Conn., assigned to The Bullard Co., Bridgeport, Conn. Patent 2,111,355.

Processes

Process for Coating Metallic Objects with Layers of Other Metals. Tadeusz Sendzimir Katowice, Poland, assigned to The American Rolling Mill Co., Middletown, Ohio. Patent 2,110,893.

Tools and Accessories

Power Hammer. George L. Kollock, Oakland, Calif. Patent 2,110,957.

Die for Forming Bolt Blanks. John H. Friedman, Tiffin, Ohio, assigned to The National Machinery Co., Tiffin, Ohio. Patent 2,111,046.

Punch and Die. Bruno Schneider,

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When the manufacturers built "Super Valves" to outlast other bronze valves from 25 to 75 times they selected a material for the seat and disc hard enough to smash boiler scale, pipe turnings and grit without making any impression on these parts. After brutal and exhaustive tests such as flattening steel nails between the seat and disc FIRTH-STERLING STAINLESS STEEL hardened to 500 Brinell was selected and has proven satisfactory in thousands of these long life valves.

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FIRTH-STERLING STEEL COMPANY

Laurelton, and Oscar Marquard, St. Albans, N. Y. Patent 2,111,156.

Magnetic Sine Table. Omer E. Robbins, Detroit, Mich. Patent 2,111,299.

March 22, 1938

Metal-Working Machinery

Ring Forming Machine and Method. Dean M. Solenberger, Cleveland, Ohio, assigned to Simplex Products Corp., Cleveland, Ohio. Patent 2,111,574.

Vertical Broaching Machine. Donald H. West, Marlboro, Mass., assigned to The Lapointe Machine Tool Co., Hudson, Mass. Patent 2,111,689.

Honing Machine. Albert M. Johnson, Rockford, Ill., assigned to Barnes Drill Co., Rockford, Ill. Patent 2,111,784.

Molding Machine (Plastic). Harold L. Jeffery, Fort Thomas, Ky., assigned to The Grotelite Co., Bellevue, Ky. Patent 2,111,857.

Heat Treating Apparatus. Bertis H. Urschel, Bowling Green, Ohio. Patent 2,111,919.

Press (Mechanical). Arthur A. Byerlein, Detroit, Mich., assigned to General Machinery Corp., Hamilton, Ohio. Patent 2,112,011 and 2,112,012.

Hydraulic Punch and Die Unit. Ralph B. Gorham, Detroit, Mich., assigned to Midwest Production Engineering, Inc., Detroit, Mich. Patent 2,112,153.

Parts and Mechanisms

Rotary Compressor. Alf Lysholm, Stockholm, and Gustav Karl William Boestad, Lidingo, Sweden. Patent 2,111,568.

Nonmetallic Gear Wheel and Method for Making the Same. Addison C .Hoof, Hinsdale, Ill. Patent 2,111,590.

Electrohydraulic System. Albert R. Kuzelewski, Philadelphia, Pa., assigned to American Engineering Co., Philadelphia. Patent 2,111,594.

Hydraulic Pump or Motor. Elek K. Benedek, Mt. Gilead, Ohio. Patents 2,111,657, 2,111,658 and 2,111,659.

Machine Tool (Spindle Counterweight). Fernand Turrettini, Bellevue-Geneva, Switzerland, assigned to Societe Genevoise D'Instruments de Physique, Geneva, Switzerland. Patent 2,111,681.

Spindle Mounting. Donald H. Montgomery, Berlin, Conn., assigned to The New Britain Machine Co., New Britain, Conn. Patent 2,111,869.

Motor Driven Headstock For Machine Tools. Albert W. Wigglesworth, Chicago, Ill., assigned to Hill-Clarke Machinery Co., Chicago. Patent 2,112,126.

Hydraulic Control for Variable Speed Transmissions. Harry C. Clay, Columbus, Ind., assigned to Reeves Pulley Co., Columbus, Ind. Patent 2,112,141.

Means for Tensioning Driving Belts, Chains and the Like. Ernest Charles Hatcher, Northwood, England. Patent 2,112,157.

Tools and Accessories

Truck Dolly. Harry I. Clark, Rockford, Ill., assigned to All Steel Welded Truck Corp., Rockford, Ill. Patent 2,111,554.

Caster. Walter F. Herold, Bridgeportport, Conn., assigned to The Bassick Co., Bridgeport, Conn. Patent 2,111,561.

Lubricator. John De Mooy, Shaker Heights, Ohio, assigned to The Cleveland Pneumatic Tool Co., Cleveland, Ohio. Patent 2,111,583.

Headgear Friction Joint Device for Welding Shields. Frederick M. Bowers, Chester, Pa. Patent 2,111,747.

Welding-Electrode Holder. Romalo Paesani, Detroit, Mich. Patent 2,111,803.

Rotary Cutting Tool (Milling). Mario Challier, Turin, Italy. Patent 2,111,887.

Grinding and Polishing Apparatus (Hone). William R. Akans, Homewood, Ala. Patent 2,111,955.

Flexible Shaft and Casing. Andrew Wyzenbeck, Chicago, Ill. Patent 2,112,004.

Single Cutter Die (Threading). Jesse D. Tucker, North Sacramento, Calif., assigned to Tucker Gilmore Mfg. Co., North Sacremento, Calif. Patent 2,112,055.

Soldering Iron. Arthur B. Cole, Bloomfield, N. J. Patent 2,112,068.

Hone. William D. Schmidt, Worcester, Mass., assigned to The Heald Machine Co., Worcester, Mass. Patent 2,112,120.

Hand Tool (Wrench). John W. Geddes, Watertown, Mass., assigned to H. K. Porter, Inc., Everett, Mass. Patent 2,112,192 and 2,112,193.

March 29, 1938

Metal-Working Machinery

Pressure Casting Machine. William M. Lester, Shaker Heights, Ohio, assigned to Lester Engineering Co., Cleveland, Ohio. Patent 2,112,342.

Pressure Casting Machine. Nathan Lester, Cleveland Heights, Ohio, and William M. Lester, Leominster, Mass., assigned to Lester Engineering Co., Cleveland, Ohio. Patent 2,112,343.

Cut-Off Machine (Tubing). Rly J. Corrigan, Detroit, Mich., assigned to Bundy Tubing Co., Detroit, Mich. Patent 2,112,396.

Apparatus for Corrugating Cylinders. Albert G. Wery, Endicott, and Leslie A. Peppler, New Brighton, S. I., N. Y. Patent 2,112,509.

Parts and Mechanisms

Self-Centering Device. Robert L. Hib-

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bard, Pittsburgh, Pa., assigned one-half to William K. Stamets, Pittsburgh, Pa. Patent 2,112,240.

Locking Means for Threading Elements. Richard T. Hosking, Wilmette, Ill., assigned to Illinois Tool Works, Chicago, Ill. Patent 2,112,493.

Locking Means for Screw Threaded Fasteners. Carl G. Olson, Chicago, Ill., assigned to Illinois Tool Works, Chicago, Ill. Patent 2,112,494.

Lock Washer. Carl G. Olson, Chicago, Ill., assigned to Illinois Tool Works, Chicago, Ill. Patent 2,112,495.

Apparatus for Welding. Robert R. Applegate, Shaker Heights, Ohio. Patent 2,112,552.

Clinch-Nut and Method of Making. Plummer E. Double, Detroit, Mich. Patent 2,112,594.

Means for Dressing Grinding Disks. Alfred Rickenmann and Eugen Kreis, Zurich, Switzerland, assigned to Reishauer-Werkzeuge Aktiengesellschaft, Zurich, Switzerland. Patent 2,112,679.

Variable Speed Power Transmission Mechanism. John Leslie Cloudsley, London, England. Patent 2,112,763.

Processes

Method and Apparatus for Forming Metal Articles (Clinch Nuts). Albert H. Gaess, Waterbury, Conn. Patent 2,112,284.

Hob and Method of Making Spline Couplings. John Edgar, Rockford, Ill., assigned to Barber-Colman Co., Rockford, Ill. Patent 2,112,455.

Method of Forming Brake Drums. John MacLennan, Detroit, Mich., assigned to Kelsey-Hayes Wheel Co., Detroit, Mich. Patent 2,112,653.

Connecting of Metal Parts. George S. Lewis, Oak Park, Ill., assigned to Battery Patents Corp., Chicago, Ill. Patent 2,112,673.

Electrodeposition of Metals. Virgil H. Waite, Elyria, Ohio, assigned to The McGean Chemical Co., Cleveland, Ohio. Patent 2,112,818.

Tools and Accessories

Adjusting Indicating System for Measuring Instruments. Henry J. Sang, Phila, Pa. Patent 2,112,252.

Reaming and Cleaning Tool. William V. Dorsaneo, Strafford, Pa. Patent 2,112,272.

Means for Gauging Saw Blades. William J. Baumann, Philadelphia, Pa. Patent 2,112,432.

Lubricating Device (Pressure Gun). Harry R. Tear, Evanston, Ill., assigned to The Lubrication Corp., Chicago, Ill. Patent 2,112,450.

Gauge for Setting Internally Threaded Blanks in a Thread Grinding Machine. Otto Hintz, Frohnau, near Berlin, Germany, assigned to Herbert Lindner, Berlin-Wittenau, Germany. Patent 2,112,491.

Spray Gun (Paint). Alfred W. Smart, Rockville Centre, N. Y., assigned to Olsenmark Corp., New York. Patent 2,112,546.

Adjustable Wrench. Sherman Hare, Grantsville, Md., assigned to Emery Georg, Accident, Md. Patent 2,112,565.

Portable Hammer Wrench. Cecil N. Douglass, Aurora, Ill., assigned to Independent Pneumatic Tool Co., Chicago, Ill. Patent 2,112,693.

Portable Electric Tool (Grinder). Frithiof P. Forss, Aurora, Ill., assigned to Independent Pneumatic Tool Co., Chicago, Ill. Patent 2,112,695.

Know What Employee Thinks

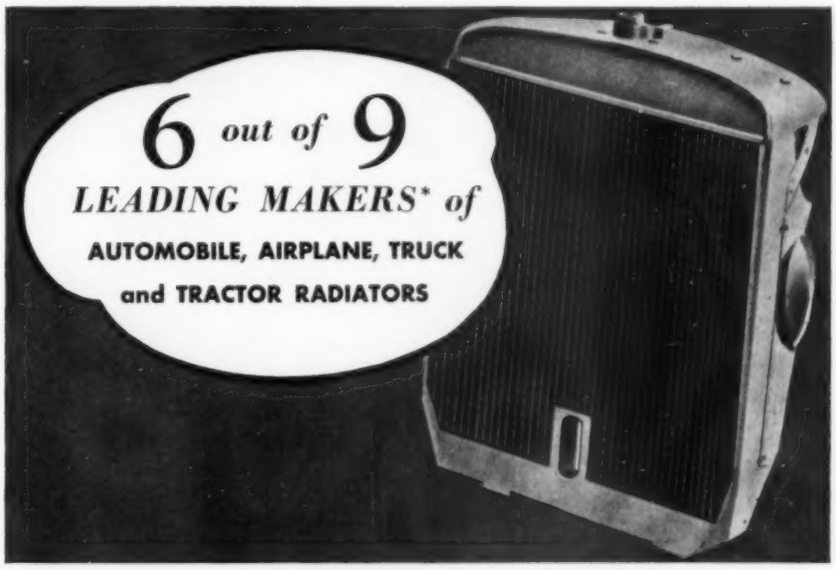
M. L. PUTNAM
Chief of Personnel Research and Training Division, Western Electric Company

If there is to be a mutual understanding among all the parties involved in the operation of an enterprise, it is just as important that management be aware of the thinking of its employees as that employees be aware of the thinking of management.

The reason the problem of employee misinformation exists is largely attributable to a deficiency in the communication between employees and supervisors and between various levels of supervisors within a company organization. By communication is meant not only the transmission of ideas and information down through the supervisory structure but also the transmission of problems, ideas and sentiments existing at work levels and at consecutive levels in the supervisory structure upward to management.

Human behavior is largely determined not by theories or logics but rather by non-logical social codes and sentiments. These non-logical codes which govern employee behavior vary according to the social position held by the employee in the company's social structure.

This applies not only to the work-



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er but also to every level of supervision.

Stated in these terms it is readily apparent that if we are going to clear up the problem of avoiding misinformation, we must emphasize the importance of understanding all of the sentiments and social factors impinging upon the worker and which make him act and think as he does. If it is true that employee behavior reflects his position in the company organization then it follows that the problem is not so much that of communicating management ideologies to him but rather that of understanding the sentiments which govern him and taking those sentiments into account in all phases of management.

Recent developments which are taking place at the Hawthorne Works of the Western Electric Company include particularly a program of personnel counseling. In this program skilled interviewers are assigned to specific departments where they spend their entire time interviewing employees and contacting their supervisors. This is an effort to understand the individual problems of employees and the problems which inhere in the network of social relationships that are built up among employees and between them and their supervisors.

From a talk at AMA Industrial Relations Conference, Chicago, February 17, 1938.

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Hard Surfaced by Welding

Experiments conducted by the Byron-Jackson Pump Company, to increase the service life of its products have revealed a method of hard surfacing which more than doubles resistance to wear. An aggregate impeller hard surfaced by the new method has already outworn two ordinary impellers.

The method of hard surfacing utilizes electric welding and "Abrasoweld" arc welding electrodes manufactured by The Lincoln Electric Co. The procedure used was as follows:

The arc welding machine was set for 175-amps. and approximately 25 volts. Beads of weld metal were run about $\frac{7}{8}$-in. wide in a circle beginning on the intake side on the outer edge of the impeller and moving in a circle to the intake orifice. The impeller was tilted during welding so that each bead partially overlapped the previous bead, and the outer edge came in contact with the top of the previous bead. This made an exceptionally smooth surface, and also helped to maintain a uniform balance. It is also evident that this decreased the amount of erosion that is usually present between beads on impellers of this type when they are put into service.

Obviously, the hardness was materially increased because this acted as a two bead application. In spite of the fact that this was a two-vane impeller little warpage was experienced, and the small amount that was present was readily taken out when the impeller was heat-treated.